BELL TELEPHONE MAGAZINE

VOL. XXI NOVEMBER, 1942 NO. 4

WAR ACTIVITIES OF THE BELL TELEPHONE SYSTEM

MORE AND MORE—WITH LESS AND LESS

BRIDGING BREAKS IN WIRE CIRCUITS BY RADIO TELEPHONE

THE AMERICAN TELEPHONE HISTORICAL LIBRARY: 20 YEARS OF SERVICE

FIRST AID TRAINING IN THE BELL SYSTEM

A. T. & T. STOCKHOLDERS IN TWO WARS

AMERICAN TELEPHONE & TELEGRAPH CO. • NEW YORK

BELL TELEPHONE MAGAZINE

Continuing the BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

"The ideal and aim of the American Telephone and Telegraph Company and its Associated Companies is a telephone service for the nation, free, so far as humanly possible, from imperfections, errors, or delays, and enabling anyone anywhere to pick up a telephone and talk to anyone else anywhere else, clearly, quickly and at a reasonable cost."

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E STANDS FOR EXCELLENCE

The emblem of the joint Army-Navy award for high achievement in the production of war equipment, here being raised above the Bell Telephone Laboratories, flies also above all the Works of the Western Electric Company. *See the article beginning on the opposite page*

WAR ACTIVITIES OF THE BELL TELEPHONE SYSTEM

The Challenge to This Organization, and Its Accomplishments in Meeting Extraordinary Demands for Service, Are Told in Broad Outline by a Vice President of the Headquarters Company

By KEITH S. McHUGH

THE scope of the Bell System's nation-wide service is, even in peace, difficult to visualize in its entirety. In war, when practically every phase of the national effort to overthrow the Axis aggressors depends in some part on swift communication, both the extent and the importance of the System's contributions to the winning of the conflict are beyond summarizing. In the past two years, numerous articles in this MAGAZINE,* and in the employee publications of the Associated Companies, have described many aspects of the System's coöperation with the armed forces, with industry, and with the civilian population. Now, nearly a year after Pearl Harbor, it seems appropriate to review both the System's preparations for the national emergency and the steps which it has taken since war became no longer a threat but a fact. To the extent that it is possible in limited space, the following article rounds out the previous fragmentary parts of the whole picture.

THE EDITORS

HITLER'S legions invaded Poland at dawn on the morning of September 1, 1939, and set in motion forces felt around the world. The repercussions struck in far-off America; even then we feared that another great world war had begun.

To Bell System men and women the invasion brought a direct warning of what might lie ahead for them as telephone people if the United States should become involved in the war. Things began to happen immediately on our overseas radio telephone circuits—in fact, they began to happen a few days before September 1, when nearly twice the normal number of

* A list of these will be found at the end of this article.

calls were made to and from Europe. First France, then England clamped rigid censorship on our circuits, only Government calls being permitted. The volume of calls over the remaining circuits to Europe and to the rest of the world jumped instantly to new high levels. The increase in telephone calls within the United States likewise carried a warning. During the first week of September the Long Lines Department handled far more long distance calls than during any previous week of the year. All communities throughout the nation were affected; the intercity wires hummed with thousands of added calls.

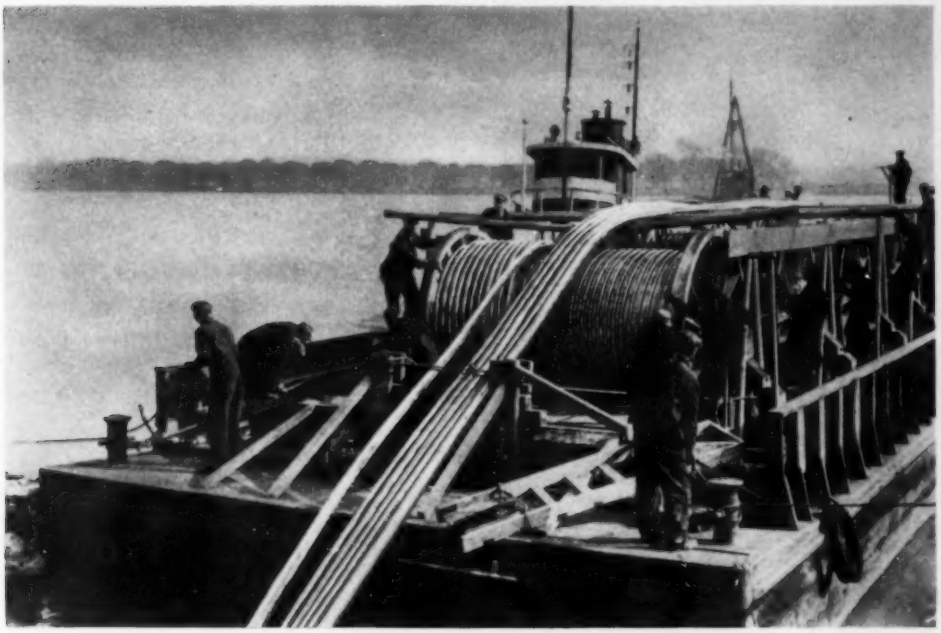
Ever Ready for Emergencies

TELEPHONE men and women are not strangers to emergencies. Floods, fires, blizzards, earthquakes, hurricanes, affecting communities or larger areas, occur from time to time. When their effects are severe, the System must meet them in much the same way it might mobilize for war, because communications must be restored before substantial relief can be given.

Fortunately, the System's organization is such as to meet these emergencies with the least practical lost motion. In this respect its plan of organization is not unlike the Army's. The functions of the headquarters' staff of the American Telephone and Telegraph Company have many similarities with the work and operations of the general staff of our Army. Flanking this general staff at System headquarters are the Bell Telephone Laboratories' organization of scientists and engineers, and the great manufacturing and supply organization, the Western Electric Company. The latter maintains not only a manufacturing and purchasing group for the materials and supplies needed by Bell Telephone Companies but a large number of strategically located supply depots containing the things needed to meet current requirements and emergencies in the field.

The Associated Bell Telephone Companies and the Long Lines Department constitute the front-line troops and reserves, the fighting forces of the Bell System. Each Associated Company is complete in itself, having its own construction forces, its own repair and maintenance people, its own experienced operating forces, commercial and accounting people and engineers. These groups appear through all levels of each company: at the general office, the division, the district, and are repeated again to the extent required in thousands of cities and towns throughout the country.

THE shock troops' efforts are aided immeasurably during times of disaster by the fact that many years ago tools, telephones, switchboards, cables, and working practices were standardized throughout the System. Thus, when a disaster occurs and it is necessary to mobilize Bell people from one area to help elsewhere in that company or in other Bell companies, the repairman does not meet new and unfamiliar kinds of apparatus and equipment, nor does the traffic operator meet with new methods of operation; each is at once at home with the instrumentalities and practices; each can devote his or her full effort to



CABLES UNDER THE POTOMAC

Six of the 12 telephone cables recently laid between Washington, D. C., and the new War Department office building across the river are here being unreeled from a barge at one time

meeting the emergency without confusion or delay.

A CASE in point is the great hurricane which struck New England and parts of New Jersey and New York in September, 1938. This disaster affected hundreds of communities, and was perhaps the most terrible thing of its kind to happen in New England within the memory of living man. From a telephone standpoint it meant some 600,000 telephones out of service; about 500 communities completely isolated from communication with the rest of the world; thousands of miles of toll wire damaged or destroyed; central office buildings flooded; transportation at a standstill.

The forces of the New England, Southern New England, and New York Telephone Companies, New Jersey Bell Telephone Company, and Long Lines went into action at full speed, but the damage was so enormous as to be far beyond the capabilities of the able men and women of these companies to repair it quickly. Within forty-eight hours, crews from other Bell Companies along the Atlantic seaboard, in the middle west, and as far west as Omaha, Nebraska, were in motion. Trainloads of men, fully equipped with trucks, tools, and emergency supplies were en route to the affected areas; crews from nearby Bell companies were rolling over the highways with their own trucks and equipment. More than twenty-three hundred men with six hundred ve-

hicles moved into the stricken areas of New England to help the more than seven thousand men of the New England and Southern New England Companies. They stayed there for weeks, working from dawn to dusk, and longer, until the job was done.

Telephone operators were flown in to Boston to do their bit. The Western Electric Company worked around the clock to supply the enormous quantities of materials required to make repairs.

The Warning Recognized

WITH such a background, and with the possibility of a war which might involve the United States, it was to be expected that the sudden increase in telephone calls in September, 1939, led Bell System people to begin at once to get ready to meet a grave emergency. When war is not immediately upon you and hope tries insidiously to triumph over experience, getting ready for war is first dependent on a state of mind. Because "business as usual" is a part of the make-up of all of us in peaceful times, it is a difficult habit to abandon quickly when war is only threatened. We all remember the long lull and apparent stalemate when the German and French armies faced each other across the no-man's-land between the Maginot Line and the West Wall. Not until May 10 of the following year (1940) did the German forces invade Belgium, the Netherlands, and Luxemburg. But, fortunately, it was the practical experience of handling the toll calls associated with the outbreak of war in Europe which made Bell System people war conscious.

On May 28 and 29, 1940, two events of great importance occurred: King Leopold of the Belgians surrendered his army unconditionally to the Germans, and the President of the United States approved the regulations governing the functioning of the Advisory Commission to the reestablished Council of National Defense. The latter action meant that the United States intended to move ahead under full steam to prepare for possible future difficulties.

It seemed to us in the Bell System that the action of the President called for specific action on our part. Six days later—curiously enough, that fateful fourth of June on which the evacuation of Dunkirk was completed—I began, at the suggestion of President Walter S. Gifford of the

FOR THE WORLD'S LARGEST PRIVATE BRANCH SWITCHBOARD

This is the Information section of the P.B.X. in the War Department office building in Arlington County, Va. That conveys some idea of how large is the main switchboard, parts of which may be seen in the upper corners of this picture

AERIAL INTERCOMMUNICATION

These "bomber mikes," designed by the Bell Laboratories and made by the Western Electric Company and now by other manufacturers also, are but one of the items of communication equipment for the armed forces to which Western Electric is devoting the greater part of its manufacturing capacity

U. S. ARMY AIR CORPS PHOTO

American Telephone and Telegraph Company, a series of discussions in Washington with high officials of the Government departments and agencies most concerned in preparing for defense or war. These included General George C. Marshall, Chief of Staff of the Army, his deputy chief, and most of the assistant chiefs of staff and the heads of many of the Army services and branches; Admiral H. R. Stark, Chief of Naval Operations, and other leading officers of the Navy; Hon. Robert H. Hinckley, Chairman of the Civil Aeronautics Authority; members of the Advisory Commission to the Council of National Defense; and Chairman Fly and other members of the Federal Communications Commission. I carried a message to each from Mr. Gifford—that the armed services and other Government agencies could count on the Bell System, its people and its resources, to do its full part in preparing for the defense of our country, or, if war came, in the winning of it. I asked each for suggestions as to how the System could be most useful.

These purposes have dominated the thinking of Bell System people since that time.

For many years during peace-time all of the units of the System had designated appropriate administrative officials as principal service representatives with the regional area and shore establishments of the Army, Navy, Marine Corps, and Coast Guard, and with their headquarters organizations in Washington. These positions were reviewed immediately by the presidents of all the Associated Companies and by executives of the A. T. and T. Company. The offices themselves were strengthened and experienced executives were chosen to head them so as best to meet the expanding service requirements of the military. The Washington service representative of the companies strengthened his office and put it on a basis of 24-hour service. A permanent war office was established at A. T. & T. headquarters in New York, manned and equipped for instant communication and action around the clock of every day. The watchword was, "Know what communication service the Army and Navy need as soon as they know it, and get it for them instantly."

BEFORE the war began in Europe, much had been done in coöperation with the Army, Navy, and Coast Guard that has since proved of great value in the war effort. Practical working arrangements for telephone service at Army, Navy, and Coast Guard establishments in peace and war had been adopted; plans for special service facilities for various types of establishments had been made; the Western Electric Company had worked out general plans with the Army for the manufacture of wire and radio communication

equipment for war use; the Bell Laboratories had carried on continuously certain important development and research work in the communication field which has proved to be of great value to our fighting forces; a practical working plan for spotting and reporting hostile aircraft had been developed in coöperation with the Signal Corps and tried out in maneuvers; and a seasoned plan of meeting disasters and emergencies was in general operation. It is of interest that these aircraft warning plans, modified by the experience of the British, are substantially those being used throughout the United States at the present time.

With the summer of 1940 the Bell System began to function in high gear in preparing for war.

SOME time earlier, a painstaking review had been made of the experiences of the System in World War I. The lessons learned from that war were most helpful in planning to meet some of the things which have already happened in this war. They included experience as to loss of personnel, provision of telephone plant, the security of plant and service (i.e., protection against sabotage and espionage), unusual army and navy communication requirements, abnormal traffic volumes, and other related matters. These earlier experiences formed the setting for conferences of operating executives of all Associated Companies called together to make careful plans to meet the problems certain to arise if war came.

While many of the actions agreed upon and precautions taken as a result of these meetings cannot be discussed here, it can be said that the plans covered a broad survey of the steps to be taken as to the safety of buildings and their essential central office equipment, of cable vaults and outside plant, of protection against fire and other damage, of the security of vital calls, of emergency methods of handling local and long distance traffic in the event of bomb or other damage, of plans to meet the work of saboteurs, and of plans to meet possible future shortages in man-power or in woman-power.

Experience in Britain

BY the time this work was under way, it seemed clear that we ought to have the benefit of British experience in England, since the British had been at war for some months and had had practical experience with many of the problems which we were considering. This information was obtained through several different sources: in part through close relations with the British Post Office officials, the result of many years of business association in the operation of transatlantic telephone service, and in part from reports of certain United States Army missions which had been in England.

The System was extremely fortunate, moreover, in having this information supplemented by a long and carefully prepared report made by a high ranking reserve officer of the Signal Corps who was also an experienced telephone executive. He went to England at the request of the Chief Signal Officer of the Army and took with him a long list of questions relating to damage, protection of plant, security of messages, war-time experience of

LONG DISTANCE CIRCUITS ARE CARRYING HEAVY LOADS

War calls are speeding through this toll switchboard in a resort center which has largely been taken over by the Army

working forces, construction, maintenance and operating under war conditions, and other related matters which had been prepared by experts of the American Company. He was given all pertinent British experience on all points and, upon his return, his report was made available by the Army and formed the basis for an immediate check of the plans agreed upon and under way throughout the System.

Today, while all plans for the protection and operation of the System in war emergencies have not been entirely completed, and in a sense never will be completed because of continuous improvements resulting from experience, the System feels confident that it can meet emergencies imposed upon it with the same spirit and, we hope, with the same results that we would expect from our armed forces on their far-flung battle fronts.

Construction Problems

As mentioned earlier, carefully prepared plans had been made with the Army and Navy for telephone service at military establishments long before 1940. It was fortunate that this had been done, because of the speed with which the military functioned in building camps, cantonments, airports and flying schools, and the speed with which our Government and private industry functioned in building plants to make the munitions of war. The number of military establishments and Government ordnance plants at which the Bell System is already furnishing or will shortly provide new and enlarged service is about 2,500. This number does not include any privately owned manufacturing plants. While

some of these establishments are not large, some of them are as big as good-sized cities.

THE story of the miracles of construction performed by the System's operating companies and the Long Lines Department in connection with these projects for the military would make a good thick book.

Many of the establishments were located far from places where we had any telephone plant at all; many others in rural areas, where existing plant was hopelessly inadequate to serve the new purpose. For military reasons, the proposed location of a new camp or munitions plant was frequently kept secret until the contractor was ready to move initial equipment onto the site. This meant in most cases that some telephone service had to be provided for the contractor on very short notice.

As the project neared completion, men, tools, and equipment began to move in, usually on a large scale. The telephone company had to have its main construction work finished prior to any large-scale occupancy of the new establishment. This often meant the manufacture and installation of a large private branch exchange with distributing plant and station equipment to serve the reservation. It meant frequently the building of a cable route sometimes many miles in length to reach the serving central office. It meant sometimes complete new buildings and central office equipment at an existing or new serving point. Near Camp Edwards on Cape Cod, for example, a new central office building with 6,400 square feet of floor space and containing 45 positions of central office equipment had to be built especially for this purpose.

Further, since army camp traffic often includes a high proportion of toll calls, it usually involves building many toll circuits from the central office to other points and reinforcing the associated long distance routes so that the messages from the camp can be carried out into the general telephone toll network of the System.

One such telephone project cost six and a half million dollars. Within four days after it was first discussed, the telephone company's engineers had prepared a preliminary statement of the material and equipment required. Service was begun within from one-third to one-half the normal time for engineering and construction. The project involved continuous work by about 1,000 people, on the average, during this construction period.

AN interesting recent project of this class is the new switchboard provided by the Chesapeake and Potomac Telephone Company for the War Department. This main board with an associated satellite board, both providing integral parts of the War Department's headquarters service, cost three million dollars, is now equipped for 15,000 telephones and, although a dial system, requires 300 operators to serve it. This is as large an installation as would be required for a city the size of Albuquerque, N. M. or Pittsfield, Mass. The main switchboard is larger than that at any single local central office in the Bell System.

Bell System people are proud of the fact that there have been no de-

MODERN METHODS FOR FOOD AND FOR COMMUNICATION

The transcontinental cable is plowed into the fertile soil of the western plains as a farmer prepares his crop close to the cable right-of-way. His tractor could pull no such heavy equipment as the deep-cutting plow partly shown at the right of the picture

lays of consequence in any of the 2,500 Army and Navy projects of this character.

Long Distance Wires Are Loaded

NOT all of the System's high speed telephone construction work has been made on or near military establishments and private plants engaged in the war effort. As the war production effort expanded throughout the country, through the drive of the War and Navy Departments and the War Production Board, the demand for long distance service increased enormously. During the two years beginning June, 1940, the System has handled over its longer toll routes added calls amounting to nearly 10 years' peace-time growth. The demand is still increasing.

Between June, 1940, and the end of 1942, over three million miles of toll circuits will have been added, involving the manufacture of thousands of miles of toll cable and the installation of carrier systems over many routes. Despite these large increases in toll facilities to serve the war-time needs of the nation, the added plant has been less than would normally be provided to keep pace with the growing demands for this service, since we have been unable to obtain, because of war necessities, the required quantities of critical materials—particularly copper.

A single incident in connection with this provision of long distance facilities may be of interest as evidence of the war-mindedness of the System. Late in 1939, it was clear that some additional circuits would have to be provided to meet the expected growth in our transcontinental service.

Four open-wire pole lines were in

existence west of Chicago: one via Minneapolis to Seattle and Portland, one through the central part of the country, and two through the southwestern states. The simplest, initially least expensive, and fastest way of providing the additional circuits required would have been by stringing some additional wire and providing the necessary carrier equipment on one or more of these routes.

A BOLD alternative was to make the heavy investment in a cable immediately. I well remember the meeting in which the final decision was made. All of the major considerations had been discussed in some detail; it was concluded to go ahead immediately with buried cables through the central part of the western United States, despite the large extra initial cost of such a program. The controlling consideration for that decision was the possibility of a war with Japan. Field surveys and engineering work on detailed plans were begun at once.

Meanwhile, on an open wire line on the southern transcontinental route, additional wire and carrier systems were constructed in order to provide more circuits to California with the least possible delay. Fortunately, these circuits were ready for service several months before Pearl Harbor.

The transcontinental cable is now practically all in place, and is in use as far west as Salt Lake City. Circuits through to the west coast will be in service shortly after the close of this year. The cost will be about $25,000,000, and the construction will make possible a telephone call over an all-cable route from coast to coast for the first time in history. While no claim is made for prophetic vision by the executives responsible, nevertheless, they foresaw that should real trouble come with Japan, not only would the volume of long distance calls between the west and east coasts require a large number of additional circuits, but the service itself ought to be made as invulnerable as possible by the provision of the new buried cable.

The System's war activities during the fall of 1940 and through 1941 until the fateful seventh of December increased steadily in number, magnitude and complexity.

The War Communications Board

IN September, 1940, President Roosevelt created the Defense Communications Board, consisting of Mr. James Lawrence Fly (Chairman of the Federal Communications Commission) as chairman, Major General Joseph O. Mauborgne (Chief Signal Officer of the Army), Admiral Leigh Noyes (Director of Naval Communications), Mr. Breckinridge Long (Assistant Secretary of State), and Mr. Herbert E. Gaston (Assistant Secretary of the Treasury). The present members of the Board are Mr. Fly, Major General Dawson Olmstead, Captain Carl F. Holden, Mr. Long, and Mr. Gaston. The Board's name has been changed to the Board of War Communications.

The Board was charged by the President with the responsibility of determining, coördinating, and preparing plans for the national defense, including the needs of the armed forces, of other Government agencies,

PHOTO BY 161ST SIGNAL PHOTO CO.

SERVING THE ARMY

These Bell System operators are some of the hundreds who are now handling calls at many Army cantonment switchboards and other locations, at the request of the War Department

of industry, and of other civilian activities for communication facilities of all kinds. These plans were to include the allocation of such facilities as might be required to meet the needs of the armed forces, the measures of control, and the principles under which such control should be exercised so that non-military communications would meet defense requirements.

It organized promptly, and created three general committees: an Industry Advisory Committee, a Labor Advisory Committee, and a Law Committee; and 12 technical committees, each to deal with a separate phase of communications. The work of the technical committees was organized and directed by an all-Government committee called the Coördinating Committee. Mr. Gifford was made chairman of the Industry Advisory Committee, and representatives of the Bell System are on five of the technical committees, one being chairman of the Telephone Committee.

Chairman Fly of the Board of War Communications, in an address before the National Federation of Telephone Workers, in Baltimore in June, 1942, noting that "our tremendous war economy . . . would be paralyzed were this great nerve center of communications ever to suffer impairment," mentioned that the Board had given attention to a wide range of war communication requirements, including the need for uninterrupted service, for secrecy, and for safety of communications. He also spoke of the Board's concern for the adequacy of man-power in the communication field. The Bell System has coöperated actively at all times with the Board and believes that the work which the

Board is doing has been of the greatest value in coördinating the communications requirements of the nation and of preparing for emergencies which might arise.

Conservation of Materials

REFERENCE has been made above to the fact that scarcity of materials has made it impossible to provide adequate facilities for all service needs. The work of the System in lessening the impact of these shortages by conservation of and substitution for critical materials of war is a fascinating story.

The Bell Laboratories and the Western Electric Company have for many years made systematic studies of the application of new or different materials to telephone equipment and of the world sources of such materials. It was quite natural, therefore, that in the fall of 1939, after the declaration of war between Great Britain and Germany, consideration was given immediately to the replacement of those critical materials coming from far parts of the world where the sources or supply routes might be affected by the war. Among these materials were tin and rubber. Of both, the System used large quantities: tin particularly in solder, rubber for insulation and in thousands of parts throughout our apparatus. When it became apparent that numerous additional material shortages would develop, a formal Committee on Substitutes and Conservation was established within the Bell System, consisting of appropriate representatives of the American Company, the Bell Laboratories, and the Western Electric Company. As additional items have been added to the critical list, plans thus made have been put in operation for their conservation and substitution.

There is not space here to go into this long story, except to say that the best technical and engineering brains and ability of the System have been devoted to the maximum savings of these things critical in the war effort. Only a few illustrations need be given to show the results. The System had been using 1,000 tons of aluminum annually; it now uses 70 tons. It had been using 7,500 tons of zinc; it now uses 1,000 tons. It had been using 1,900 long tons of rubber; it now uses 200 long tons. It had been using 980 long tons of tin; it now uses 130 long tons.

SIMILAR illustrations could be made by the score, but these will suffice. The limitation orders of the WPB were, of course, important factors in this work; but we know from the week-to-week work of our own people that in most instances they anticipated the extraordinary war needs for materials and possible action of the Government, and took many of the necessary steps in advance of the Government's conservation orders.

Despite every effort to conserve materials, the war-time demands of the nation for new communication facilities have required a very large construction program during the last two years. It is of interest that in metropolitan Washington, D. C., the Chesapeake and Potomac Telephone Company has added more new plant in the last twelve months, largely to meet the expanding needs of the Government,

ARMY MEN GET BELL SYSTEM PLANT TRAINING

The three groups of Signal Corps men shown here with their Associated Company instructors (in "civvies") are learning about inside wiring, station equipment, and central office line circuits. Plans have been completed for a continuous training program at the rate of about 5,000 Signal Corps men a year

than existed in the city at the close of World War I.

For the Bell System as a whole, the total gross construction in 1940 was $380,000,000, in 1941 $520,000,000, and in 1942 will be about $460,000,000. This enormous program has required large amounts of new capital, a continuously heavy manufacturing and construction job, and large installation and construction forces.

THE many problems involved in obtaining the materials needed for construction of telephone plant have called for continuous close relations first with the National Defense Advisory Commission, later with the Priorities Division of the Office of Production Management, and subsequently with the Communications Branch of the War Production Board. Since substantially all of the manufactured equipment and supplies to meet the requirements of the Associated Companies are produced or purchased by the Western Electric Company, the physical and factual problems both for Bell System people and for officials of the War Production Board have been much simpler than they would have been had these problems been related separately to each of the Associated Companies and the Long Lines Department and to a number of manufacturers. Nevertheless, because of the relatively large demands for nation-wide telephone service, the work of continuous coordination of these essential requirements with the nation's other wartime needs for materials has been substantial and continuous. From the outset the engineering organizations of the American Company and the Associated Companies and the

SERVICE FOR SERVICE MEN

Pleasant surroundings and helpful attendants on or near Army posts are part of the System's effort to make it easy for soldiers to place their calls

manufacturing department of the Western Electric Company have considered this one of their most important and pressing problems.

The War Comes First

THE policy of the System from the beginning as to these needed materials has been very simple: The war needs of the nation must come first; the needs of the nation for additional communication facilities must be subordinated to the fundamental purpose of winning the war—excepting as it is clear to the authorities in Washington that certain of these communications requirements are substantially equal in importance to the needs for munitions of war. The telephone companies have been and are determined to give the best telephone service possible with whatever materials the Government feels should be utilized for communication purposes.

In pursuance of this policy, the nation's needs for additional communication facilities to serve new Army camps and munitions plants, and to handle the flood of long distance calls occasioned by the war production efforts of industry, have been checked continuously with officials of the War Production Board and to a considerable extent with the interested representatives of the Board of War Communications, the Army, the Navy, the Joint Army and Navy Munitions Board, and the Federal Communica-

tions Commission. All of these Government organizations have given careful and painstaking attention to the communication needs of the country and of the armed forces. They have been keenly aware of the essential nature of such communications and at the same time have been fully alive to the necessity of balancing these requirements against other vital material requirements for other war purposes.

Pearl Harbor—and After

THE attack on Pearl Harbor had the force of an explosion within the System. From the first news I had that bleak Sunday afternoon until the small hours of the next morning, I was on the telephone almost continuously. Mr. Gifford and hundreds of executives and administrative officials of the System had similar experiences. The Government—especially Army and Navy officials—discussed with us many urgent features of our operations.

Local and long distance traffic on the West Coast jumped tremendously. The toll traffic all over the country, particularly over the transcontinental routes and into and out of Washington, soared to new and all-time highs. The army of telephone workers had only to know that they were needed. Telephone operators rushed to central offices to man the switchboards. Plant forces jumped into action. The Bell System was in the war!

FOR SAILORS TOO

Shore leave, or its equivalent at a training station, gets off to a good start when calls may be made from an attended station such as this

The first call I received that Sunday afternoon was a request that all calls in and out of FBI offices throughout the United States be given precedence. That message was flashed immediately by our headquarters to all of the operating units of the Bell System, in order that the fastest possible service might be given to this important agency of the Government. Advance plans made it possible for Navy censors to move in on overseas circuits within a few hours.

In the city of Washington and elsewhere, major feats were performed in meeting the emergency. In the toll operating room in Washington stood some 30 positions of toll switchboard on which the wiring had been only partially completed. Plant forces of the Western Electric Company and of the Chesapeake and Potomac Company put these boards into operation within eighteen hours. Emergency plans for the fastest possible handling of vital calls from high officers of the Army, Navy, and other Government departments were put in effect immediately. Extra positions of special equipment were installed in the Washington toll office wherever there was space. While the demands on the several telephone companies differed, each one bent every effort to the job. The urgent war calls had to go through.

Increasing Responsibilities

SINCE Pearl Harbor, the volume, number, and complexity of System war activities has steadily increased. Only a few illustrations can be given.

The War Department at many locations throughout the United States had operated its own switchboards, partly with soldiers and partly with civil service employees. The telephone companies were asked to take over a large number of telephone systems at these camps and other establishments in a hurry and to maintain the systems and operate them. Studies were made at each location on a rush basis, and today the System is handling the service at 150 Army camps and establishments requiring over 2,000 telephone employees for operation and maintenance of the systems.

THE Signal Corps, to expedite its own training program, wanted assistance through use of Bell System technical schools, in training soldiers to become installers, splicers, repairmen, and teletypewriter maintenance men. Hundreds have already been trained and plans have been completed for continuous training at a rate of about 5,000 per year.

Experts of the Bell Telephone Laboratories are conducting a continuous school for Army and Navy men in the operation and maintenance of certain new radio protective equipment and other complex electrical equipment essential to mechanized warfare.

The overseas radio stations of the System are proving of great value to the Government. Not only have they provided continuous means of communication between the United States and its representatives in far distant lands but, at the request of the Government, arrangements have been completed to convert some of them to special communication purposes for the War Department and other branches of the Government.

ACME NEWSPHOTO

A FILTER BOARD OF THE ARMY'S AIRCRAFT WARNING SYSTEM

Developed in co-operation with the Signal Corps before the outbreak of war, and modified by the experience of the British, the system is in operation day and night throughout the country. "Flash" calls from volunteer aircraft observers reach these women, also volunteers, in an average of about 30 seconds

BEFORE and since Pearl Harbor the engineers and scientists of the System have been continuously at work in developing new communication facilities and services of especial interest and necessity to the armed forces. In addition, the Bell Laboratories is engaged, for the Army and Navy, in the development of new tools of warfare involving communication techniques. Most of this work is secret and cannot be discussed until after the war; but it can be said that all available resources of the Bell Telephone Laboratories are now devoted to these and related purposes.

The Western Electric Company likewise is now devoting almost all of its manufacturing effort to war work, building vast quantities of intricate radio and wire communication equipment for the armed services. Radio equipment built by Western is being widely used in ships, tanks, and aircraft of the United Nations. Western's organization has more than doubled, and further increases will probably be made by the end of the year.

Thousands of miles of private line circuits, some with special forms of operation and equipment, have been

provided for the armed services, the Civil Aeronautics Authority, and other departments of the Government.

Service for Soldiers, Sailors, and Civilian Defense

SPECIAL attention has been given, also, to the soldiers' and sailors' needs for telephone services at camps and shore establishments. Thousands of public telephones were installed at locations convenient for their use, special mobile equipments were provided to make telephones easily available to soldiers at remote points, and in many of the larger camps cheerful telephone operators appeared and stayed on the scene to help the soldier or sailor make his calls. At each of the larger military establishments the Associated Company has appointed a permanent resident manager, who sees to it that facilities are available for the use of the military forces and that the service is rendered with maximum efficiency and in the most pleasing manner.

Paralleling the communication work for the operation of the armed forces themselves, there has come a large program of meeting the communication requirements for the civilian defense—both for the Army aircraft warning service and for local Civilian Defense organizations. When the War Department and the Office of Civilian Defense wanted assistance in the laying out of filter and information centers for air raid warning purposes and in the development of special communication facilities to meet the requirements of local, county, and state defense agencies, we were in a position to provide designs and, shortly, equipment embodying the best of the experience abroad and the best brains of our scientists and engineers. Every effort is made to furnish the maximum speed of service for these purposes. As a result of this coördinated effort, thousands of operators are able to handle Army "flash" calls at a current average speed of about 30 seconds from the time the aircraft observer or spotter lifts the receiver until the call is answered at the Army filter center.

Each Associated Company throughout the country organized small groups of specialists to handle these matters with the representatives of the local, state, and Federal Governments. No attempt has been made to compile a composite picture in detail of the communication facilities which have been provided for these purposes, but in the aggregate they run into thousands of items of equipment and many hundred major installations throughout the country.

IT would not be appropriate for me to attempt any description of the fine war job which has been done and is being done by independent telephone companies throughout the country. I can only pay tribute to them here and leave it to some one in their own group to tell their story. The war has emphasized the essential unity of all telephone people, Bell System and Independent. Their purpose is victory; it is being sought with utmost determination and with untiring effort. From the outset it has been the continuous view and practice of both groups that any mutual telephone problems involving the war effort must

FOR SERVICE AWAY FROM HOME

These Long Distance operators, about to entrain for a distant city, have volunteered for temporary transfer to Bell System companies whose switchboards are loaded with war calls. Similar transfers have been made among a number of Associated Companies recently

be straightened out within the industry and that nothing must interfere with the communication requirements of our armed forces or of the nation's producers of ships, guns, tanks and planes.

Bell System Men and Women

No story of the System's war activities would be complete without some reference to the part its people are playing in the war. Up to November 15, about 29,000 men from the System have gone into the armed services. Some of these men were called to active duty as members of the Army or Navy Reserves to which they had belonged before the emergency. Many more have gone in via the normal routes of the Selective Service or regular enlistment.

About 2,000 have volunteered for special service in the Signal Corps. Many of these are older men of considerable experience, often in administrative or supervisory positions, who have volunteered at the request of the Signal Corps to become commissioned officers or technicians in construction, maintenance, and operating units of the service, where their special knowledge and training can be of the greatest possible value. In this

particular branch of the services, it is expected that, by the end of 1942, some 4,000 highly skilled craftsmen and men in responsible supervisory positions throughout the System will have volunteered for duty.

IT is known now that Bell System men in the uniform of our country are already in service in such far-off places as England, Egypt, India, Hawaii, the South Seas, and Australia. In World War I some 25,000 Bell System people were in the services. Already, more than that number are in the armed forces of this war; and if it continues, it now seems certain that many more will see active military service.

Besides those in direct military service, a number of Bell System executives, engineers, and scientists have been spending full time or part time as civilians in important Government posts on direct war work. These include work with the Army and Navy, the War Production Board, the Office of Price Administration, the National Defense Research Committee, and other agencies.

IF the leaders of our Army and Navy were asked as to the occupation for women which they considered most important in order that the armed services could perform their full function in the best interests of the nation, I imagine that "telephone operator" would appear near the top of the list of every one of them. If they knew the telephone business intimately, they might well say "telephone girls," to include all the 225,000 women of the Bell System—operators and others in many different types of work.

The army of telephone operators and girls in other departments of the Bell System have a proud tradition of service behind them. They have performed in accordance with that tradition since things began to hum in 1940, and particularly since Pearl Harbor. Traffic volumes, notably long distance, have been increasing enormously—at some war-busy places by leaps and bounds. Surges in the number of calls come frequently without warning. The living creed of these girls—in small country towns, in large cities, and in all operating work—is, "The Message Must Get Through." Many, eager to serve where they are most needed, have volunteered for work away from their homes. Many others are serving at attended public telephones that have been provided at and near military camps and training stations to make the telephone service more convenient and more pleasing. All are ready to work around the clock, on Sundays and on holidays. This year the System will hire 75,000 women for telephone operating alone.

THOSE of us who are not in the military service total more than 400,000 Bell System men and women—working on the home front. Besides our telephone work, we are doing our part by buying War Bonds at the rate of $75,000,000 per year. Ours is a very active home front, because we are daily handling calls and meeting the telephone requirements of the Army and the Navy, of the great war production factories, and of the day-

to-day needs of our citizens. We provide means of warning, should the enemy invade our skies. We serve those who guard us against danger from without and against emergency and disaster from within. Whether on the home front or with the armed services, the part of each and every Bell System man and woman is a glorious part.

We serve the nation in peace and in war.

The following is a chronological listing of articles already published in the BELL TELEPHONE MAGAZINE which discuss or have a bearing on the Bell System's part in national defense and its contributions to the war effort:

"A War Game Test of Telephone Service," January, 1939.

"Another War Game Test of Bell System Services," July, 1940.

"The Bell System's Part in National Defense," October, 1940.

"The Bell System and National Defense," February, 1941.

"Engines for Defense," May, 1941.

"Western Electric: Telephone Arsenal," August, 1941.

"An Operating Company's Part in National Defense," November, 1941.

"Providing Substitutes for 'Critical' Telephone Materials," November, 1941.

"The Present Situation and the Present Outlook," November, 1941.

"Engineering the Transcontinental Telephone Cable," November, 1941.

"We Shall Justify Their Faith," February, 1942.

"Telephone Lines and Air Defense," February, 1942.

"The Mobilization of Science in National Defense," February, 1942.

"The Role of the Telephone in the Civilian Defense Organization," June, 1942.

"War-Time in the Traffic Departments," August, 1942.

"Doing a Bigger Job—With Less," August, 1942.

"The Organization of Large-Scale Engineering Work," August, 1942.

"Protecting the Service against Fire," August, 1942.

MORE AND MORE—WITH LESS AND LESS

To Handle More Telephone Calls Than Ever, Over Facilities Taxed Nearly to the Limit, Is a Challenge Which the Soldiers of the Switchboard Are Meeting in Traditional Fashion

By HAROLD M. PRESCOTT

This brief statement was originally written for publication in the employee magazines of the System's Associated Companies, and was submitted to their editors for use without the name of the author—who is Traffic Engineer of the A. T. and T. Company. It so vividly epitomizes both the problems which wartime conditions impose on the Traffic Departments and the spirit with which they are being met that it is reprinted here as supplementary to "War-Time in the Traffic Departments," which appeared in the MAGAZINE *for last August.*

THE EDITORS

"AH, ME," said the Experienced Operator, "remember the 1930's? Those were the days of service *with*."

She couldn't have said it better. Service with plenty of switchboards and plenty of circuits. Operators and equipment ready and waiting to handle every call. Long distance calls put up in a matter of seconds to points far and near. That was service *with*.

Each year, too, brought forth new developments that simplified the operator's work and improved the handling of calls. Service approached technical perfection. Of equal importance, it became increasingly friendly and pleasant. To telephone users, our desire to serve was more apparent than ever before.

AND then came War. Our country's defense activity, starting in 1940, shifted into high in the next few months. Long distance traffic jumped more than a third in 1941. In many places calls doubled and trebled, and on some routes they at times increased seven- and eight-fold. Traffic records were knocked galley-west. You operators who came on the job in 1941—you set a record, too, for you were the largest "class" ever to join the Bell System in a single year. And you went right to work, side by side with others more experienced, to handle more calls from more telephones than were ever handled before.

But that was only the beginning.

Today we must put through even more calls, and more of those calls are important. Though millions of miles of new circuits have been added, still the plant has filled up and in many places overflowed. We know, too,

that the limit of plant expansion has been pretty nearly reached, because the critical materials required can no longer be obtained: Uncle Sam needs them for bullets and weapons. From an easy service situation a few years ago, we have moved into a period when we must give service *without* the facilities we would like to have.

ALL of you at the switchboards—older and younger together—know how great your opportunities are to serve your country in the telephone army of the nation. You wear no uniforms and carry no rifles, but you are *soldiers of service,* and your positions are battlefront positions. For you weave the messages that speed the building of the tools of war—messages that coördinate the training and movement of soldiers and sailors—messages that knit the chain of aircraft warning and civilian defense—messages that help the man who fights to keep in touch with loved ones at home.

The job to date has been marvelously well done. Can you—we—all of us—keep up the good work? Can we continue, in time of war, to give the courteous, accurate "service with a smile" that won fame in time of peace? We think we can—we *know* we can; this will be our contribution to winning the war.

The task ahead will not be easy. Until victory is won, we will not have the facilities we need. But this is certain: all the experience, all the ingenuity of Bell System people, who have given and will continue to give this nation the best telephone service in the world, will be brought into play to make the best possible use of the things we do have.

TRAFFIC men and women are on the alert. They are looking ahead, eager and determined that telephone service will not only remain good, but that under the circumstances it will be remarkably good. Facing squarely all the problems of service *without,* we're still going to give service *with—with everything we've got!*

BRIDGING BREAKS IN WIRE CIRCUITS BY RADIO TELEPHONE

More Than a Hundred Emergency Sets, Strategically Located Over The Country, Are Available to Restore Temporary Service Quickly While Permanent Repairs Are Completed

By AUSTIN BAILEY

In September, 1933, when a hurricane centering between Palm Beach and Fort Pierce, Florida, damaged the wire telephone system, radio telephone stations at New York and Miami normally employed for overseas services were used for about a day and a half to provide an alternate traffic route into the storm area while repairs to the wire circuits were being completed.

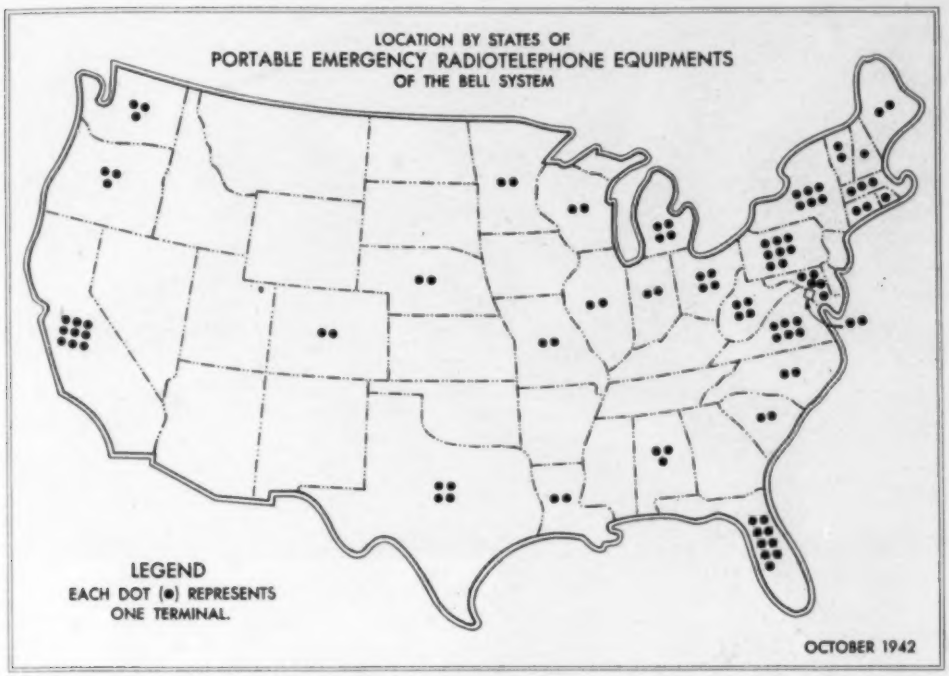
After the New England hurricane of September, 1938, an established radio telephone circuit in the Boston-Provincetown group provided for a time the only connection with all of Cape Cod as well as with the islands of Martha's Vineyard and Nantucket.

On the Pacific Coast, the coastal harbor radio telephone stations at Seattle, San Francisco, and Los Angeles have, in emergencies growing out of flood and storm, been employed for point-to-point emergency service.

It is seldom that established radio telephone stations normally used in other services happen to be so located that they are of value at the time of an emergency. These instances illustrate, however, how telephone transmission by radio can be used to provide alternate routes to hurdle temporary gaps in wire circuits, caused by nature or by accident, if suitable radio terminals are available on both sides of the damaged telephone wire plant.

If wire circuits are damaged in an area where such established radio terminals do not exist, and where alternate wire routes are inadequate or may also have been destroyed, other types of radio equipment, plus a good deal of electrical knowledge and ingenuity, have been called on to save the day while damaged lines are being repaired. On several occasions, available radio equipment built for ship, airplane, and police use has been installed on short notice and operated to give some communication during an emergency.

When a tropical hurricane in September, 1935, almost completely destroyed 35 miles of telephone line along the Florida East Coast Railway across the Florida Keys, voice communication with Key West and with Havana, Cuba, which is reached over a submarine cable from Key West,



was restored by employing airplane-type radio equipment. Stations were established at Tavernir and Big Pine Key to bridge the over-water gap by radio telephone, and the service was continued in operation for four months, such was the extent of the disaster and the inaccessibility of the right-of-way where the railroad had been.

AFTER the New England hurricane of September, 1938, radio telephone transmitting and receiving sets, with gasoline-driven generators for providing the necessary power supply, were rushed to Boston by air express.

Two ultra-high-frequency radio telephone sets of the type employed in small police stations were the first to arrive in Boston, and these were immediately sent to span a river where the floods had washed away a river crossing. Since they were not arranged for connection to the wire lines, those wishing to talk came to the location of the equipment to send their messages.

Two other sets were special assemblies of ship equipments which came from Florida, where they had been held in readiness for similar hurricane emergencies. These were employed between Gardner, Mass., and Keene, N. H., and made a part of a Boston-Keene circuit.

Of the central offices isolated by this great disaster, fourteen per cent were first reconnected to the general telephone network over circuits which employed in part a radio telephone link. In the days following the storm, over 5,000 messages were completed, many of an urgent emergency nature,

AFTER THE NEW ENGLAND HURRICANE OF 1938

Under the tent is one of a pair of ship radio telephone equipments, brought by air from Florida, which temporarily reconnected New Hampshire to the Bell System long distance network

through the use of radio telephone circuits.

TELEPHONE lines are built to withstand all but the most abnormal conditions, ninety-five per cent of them are in aerial or underground cable, and the provision of alternate routes in all but sparsely settled areas is a service objective. Sometimes the elements do conspire, none the less, to put circuits out of service, and to isolate groups of people, telephonically speaking—as the foregoing incidents have illustrated. They, and others, illustrate, also, the value of radio telephone equipment for emergency and temporary use. It was a natural consequence, therefore, that as part of the Bell System's constant effort to safeguard the service, the Bell Telephone Laboratories should design units of radio telephone equipment specifically engineered to meet emergency situations of that kind: to bridge temporary gaps in wire lines quickly and until the breaks can be repaired. The Western Electric Company began manufacture of these special radio telephone sets in 1938.

Harnessing Radio Circuits

To the uninitiated, it would seem to be a simple matter to employ radio as a link in a wire telephone network system, but there are numerous engineering problems involved which make such use of radio rather complicated. Let us briefly consider some of them.

The broadcasting kind of radio telephone transmission is basically quite simple; but, as everyone knows, it carries a one-way message only. The

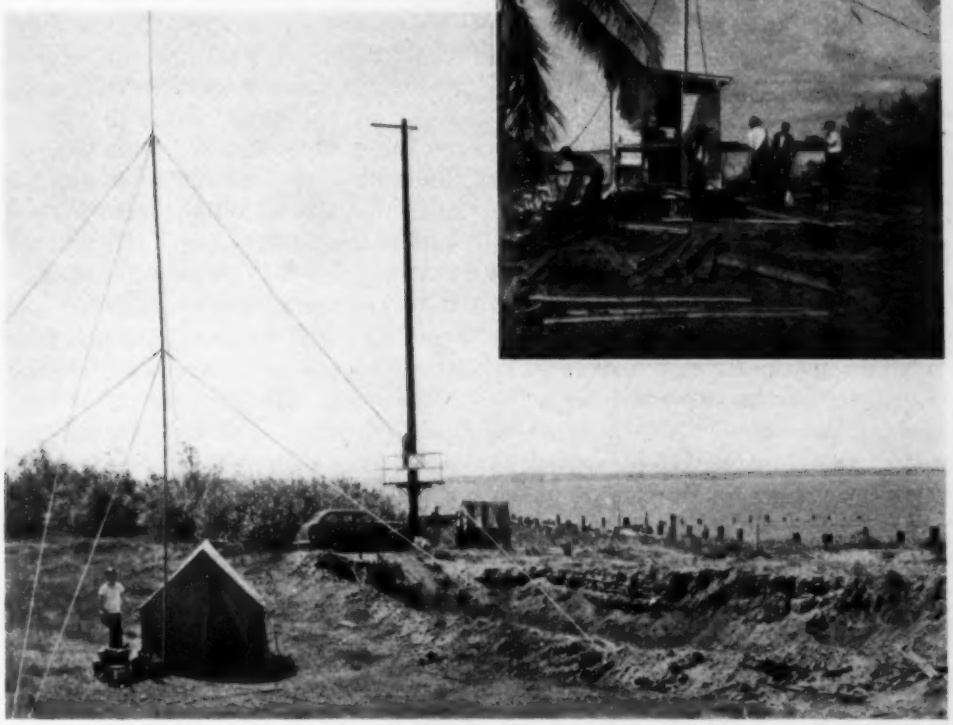
performer must speak into a particular microphone, and the "reply" is received in the form of "fan mail" or by other systems of communication.

In the police type of two-way radio system, there are really two broadcasting systems, working in opposite directions, and separate and complete from microphone to loud-speaker.

The next step in the interconnection of two-wire telephone lines with a radio link is represented by the coastal harbor systems, where the ship end of the connection still has separate microphone-plus-radio-transmitter and radio-receiver-plus-loudspeaker circuits. However, the coastal station requires terminal equipment to connect between the radio circuit, which at any instant may be either transmit-

IMPROVISED RADIO TELEPHONE STATIONS

Right: Installing emergency radio telephone equipment at Tavernir, Fla., which bridged the gap to Key West and Cuba after a hurricane while permanent repairs to the line were completed. Below: On the banks of the Columbia River. Complete transmitting and receiving apparatus is installed in both tents, establishing two working circuits across the river



ting or receiving, and the two-wire line, which can always be used in either direction.

The final step in the development of this series is the connection of two-wire telephone circuits at both ends of the radio link. This is best represented by the overseas radio telephone circuits. Overseas terminal arrangements are necessarily complicated, expensive, and bulky. On the other hand, while emergency radio telephone equipments for application in a wire network system need to connect at each end to two-wire circuits, the terminal arrangements must be simple, inexpensive, and readily portable.

That was the general problem—or series of problems—which was posed for the System's scientists, engineers, designers, and equipment manufacturers. It probably is of interest to see just how this interconnection with wire lines at both ends was finally engineered for Bell System portable emergency radio telephone equipments.

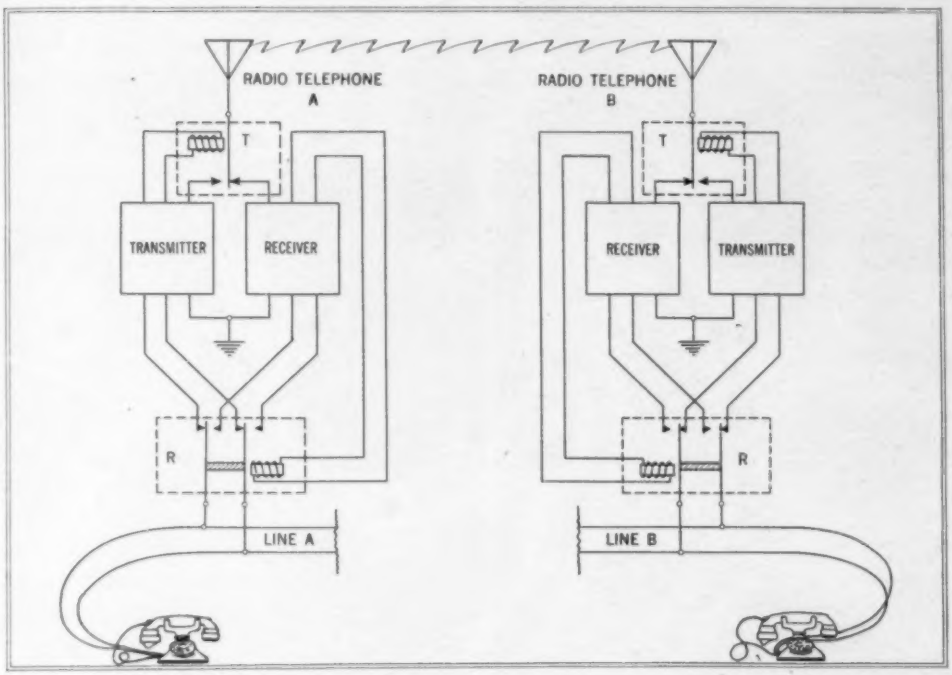
How the Units Work

IN the diagram on page 233, two radio telephone terminals are schematically indicated in use to bridge a gap between Line A and Line B. Suppose the subscriber on Line A begins a conversation. The speech currents from his telephone instrument are connected through relay R to the radio transmitter. Inside the "A" radio transmitter, a part of these speech currents is taken off in a branch circuit and made to produce current which turns on the radio transmitter and which by also operating relay T connects the radio transmitter to the antenna. A speech-modulated radio wave of characteristics similar to that sent out by a standard broadcasting station is then transmitted by radio.

When this wave reaches the "B" radio terminal antenna, it goes directly into the radio receiver through relay T. In the "B" radio receiver, a part of the amplified received signal is employed to produce current to operate relay R. This relay connects the radio receiver to the two-wire line and thereby clears the path for the speech currents to travel on to the subscriber on Line B.

When the Line A subscriber stops talking, both relay T of the "A" equipment and relay R of the "B" equipment return to normal, and the way is made ready for the Line B subscriber to reply. In the reverse direction, the operation is similar except that relay T of the "B" equipment and relay R of the "A" equipment are this time caused to operate by the talker connected with Line B. Repetition of these operations of the relays occurs with the to-and-fro nature of the conversation.

During periods of no conversation, both radio transmitters are "off the air" and the system at both ends stands ready to accept an incoming radio signal. On the line side of each radio terminal, the equipment likewise stands ready to respond to speech currents from a subscriber's telephone. In order to operate successfully a telephone circuit with reversal of its direction of transmission under the control of speech currents, the relays must operate fast enough to prevent any important loss of the initial syllables spoken. At the same



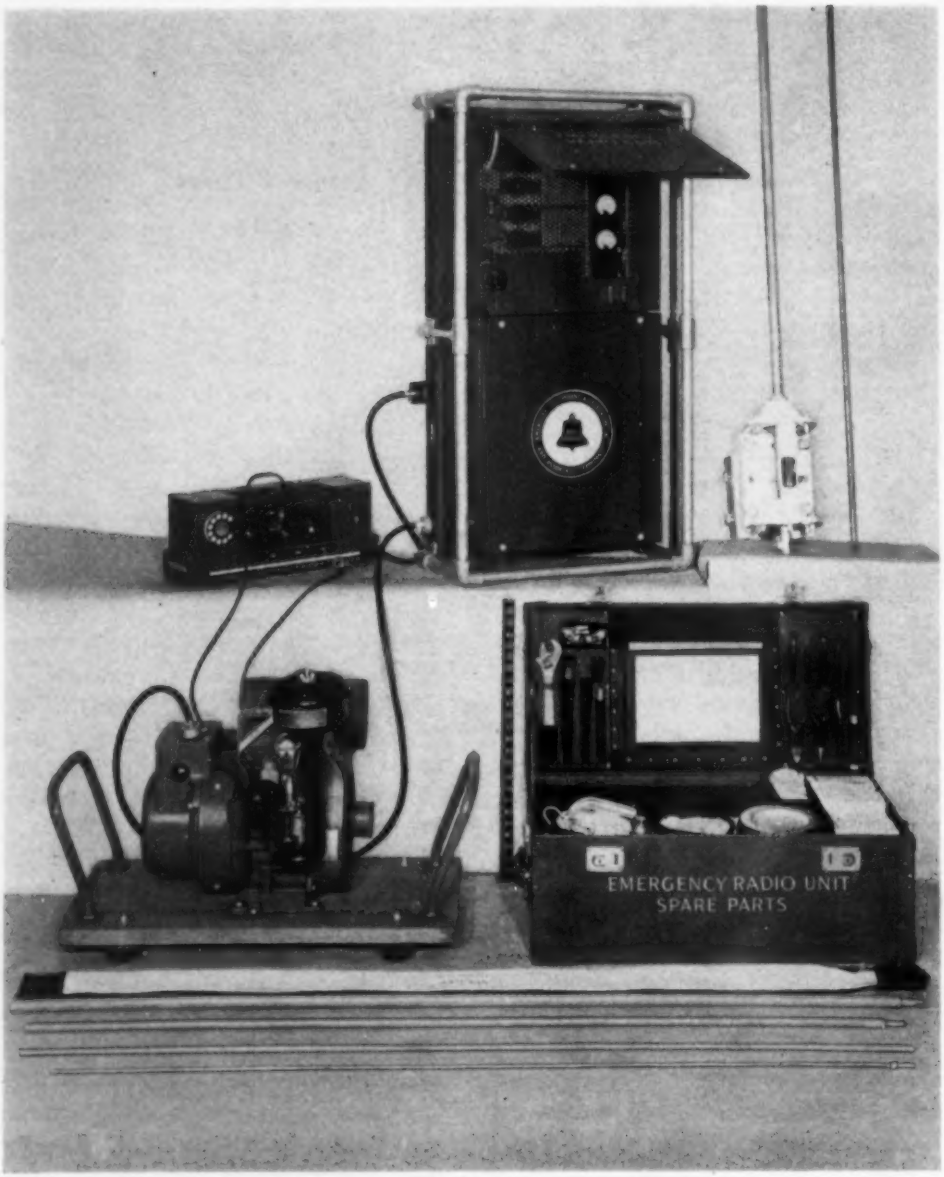
SIMPLIFIED DIAGRAM OF THE OPERATION OF THE PRESENT EMERGENCY RADIO TELEPHONE EQUIPMENTS

A non-technical description of how they work is given on the opposite page

time, experience has shown that the relays must be slow in releasing, to prevent chopping up sentences between words. One penalty that an arrangement of this kind places on the free flow of conversation, then, is that each speaker must be courteous enough to listen to the other without interruption until he has finished a sentence. In fact, if one speaker should try to interrupt the other, his attempt will meet with failure because the emergency radio terminal will prevent it.

THE questions might well be asked, "Why all these relays? Why not just connect the radio transmitter and receiver to the wire lines and go ahead and talk?" There is, of course, a definite—though somewhat technical—reason.

If both radio transmitter and radio receiver were connected together, then obviously everything that came out of the radio receiver would go into the radio transmitter and be sent back as an echo to the other end of the line. Furthermore, if the other radio terminal was similarly arranged, this echo would come back again behind the original word and continue to chase itself around this closed loop until it became dissipated. If the radio system amplified the signals, the circuit not only would sound hollow, like shouting into a rain barrel, but it actually would build up into a howl



COMPONENTS OF AN EMERGENCY RADIO TELEPHONE UNIT

The parts and their functions are described on the opposite page

and prevent any further conversation. The relays effectively prevent such conditions by making the radio link a "one way at a time" circuit. In fact, the arrangement does more than this, since only one antenna is required for the radio equipment at each terminal and but a single radio channel is needed for both terminals.

The Component Parts

SOME of the essential electrical parts of the Bell System's emergency radio telephone equipments have been suggested by the discussion of the diagram. In the photograph on page 234, the radio unit is shown near the top center. The framework, with a hand rail to furnish a substantial base and facilitate its transportation, mounts at the top the radio transmitter, and in the lower half is the radio receiver. The dust-cover door of the radio transmitter is open, as it would be during actual operation.

To the left of the radio unit, and connected to it by a plug-in cord, is the control unit with an ordinary telephone hand set. When the equipment is in use, the wire lines are connected to this control unit. The control unit provides the radio operator with means for signaling or ringing, as well as for talking on the wire lines and over the radio circuit. The spare parts trunk, in which the control unit is kept during transportation, also carries a miscellaneous assortment of tools, vacuum tubes, antenna system materials, and testing equipment.

In the foreground of the photograph are parts of a demountable antenna rod and its canvas carrying case. When assembled for use, this antenna rod is 25 feet in height. For transmission over quite short distances it can be supported in a base insulator unit, as shown at the right of the radio unit. For transmission over longer distances this 25-foot antenna rod is supported on an extension pole, to make an antenna some 50 feet tall.

The remaining unit in the photograph is a gasoline-driven generator capable of providing all the power supply necessary to operate the radio terminal, including some auxiliary equipment which may be needed. The radio unit may be operated from commercial power supply whenever it is conveniently available. However, the same unusual occurrences which temporarily disrupt telephone service may likewise be destructive to electrical power networks. For this reason, as well as to increase the speed of getting emergency radio telephone equipment into operation, a power supply is provided with every unit.

THE output of the radio transmitter in operation is 50 watts. The emergency frequency assigned by the Federal Communications Commission for this kind of service is 2,726 kilocycles. The equipment is so constructed that operation at any frequency in the range between 2,000 and 3,000 kilocycles is possible by changing the quartz crystal elements which control the frequency and making minor tuning adjustments. The power required from the supply source to operate the complete equipment is about the same as is needed to operate an electric flat iron. Such facts as these are of interest, but are only incidental to the primary purpose of the entire radio terminal.

The total weight of all the units

represented in the photograph is less than 500 pounds, and no single unit weighs more than 180 pounds. The approximate size of the individual unit may easily be judged from the 2-foot ruler included in the photograph. Where emergency conditions exist following major disasters such as hurricanes, sleet storms, floods, fires, and similar occurrences, there are good reasons to have the equipment as light in weight and as convenient to handle as is compatible with reliable operation. Of course, any such complicated equipment contains some parts, such as the glass vacuum tubes, electrical meters, and quartz crystals, which are fragile. A certain amount of care in handling is, therefore, necessary. If two men can load or unload the equipment conveniently, the hazard of rough handling is considerably decreased.

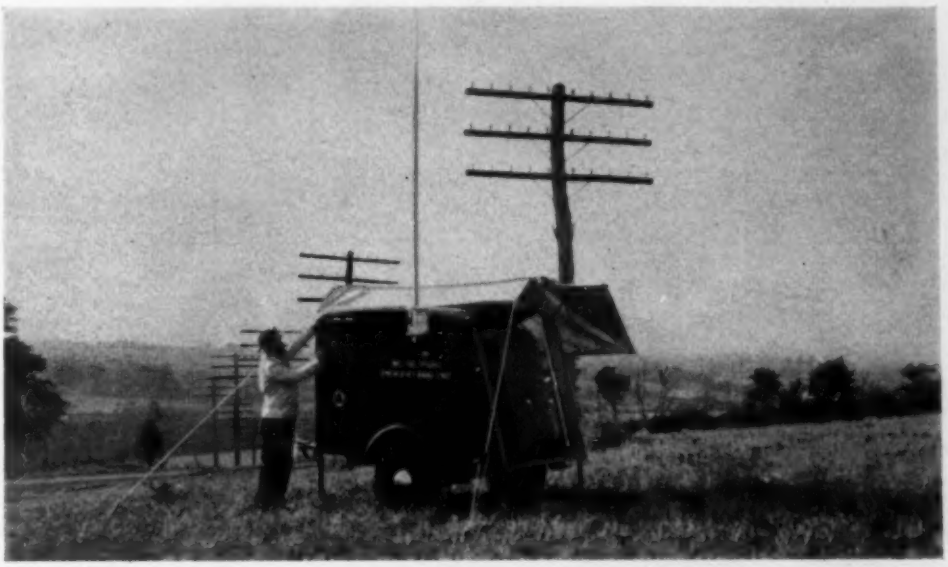
Transportation by Trailer

SOMETIMES it is necessary to employ airplanes, railroad cars, or boats to get an emergency radio telephone into a location where it can be used. However, experience has shown that motor vehicle transportation is possible in most cases. A special radio telephone trailer has therefore been made available for transporting the equipment to the location where it is needed, and with as little delay as possible.

In designing this trailer, arrange-

PRESENT-DAY OPERATION

This is one of the pair of emergency units which maintained service across the Hudson River after a drifting vessel had severed submarine telephone cables



A TRAILER ON THE JOB

Note the tarpaulin used as an awning, and the antenna mounted on the body for service over a relatively short distance

ments were made to employ it not only for storing and transporting the equipment but to serve as operating quarters when on location. Because the equipment is placed in the trailer in such a way that it may be put into immediate operation once it reaches the scene, much time can be saved which otherwise would be used in looking for proper shelter for the operators and equipment before setting up for service. However, the necessity to use other means of transportation on occasion has not been overlooked, and the equipment is so installed that it can be removed readily from the trailer when necessary.

THE photographs on this and the next two pages show the trailer as it is employed to complete the radio telephone terminal for use during emergencies. Ample space for the comfortable operation of the radio equipment is provided in the front half of the trailer, where the radio and associated control equipment have been installed. The rear half, separated from the front half by a gas-tight partition, houses the gasoline-driven generator unit. It likewise provides space for storage of miscellaneous items of equipment and supplies needed under such conditions. The antenna materials, ropes, tarpaulins, wire, water jug, oil supply, shovel, axe, saw, jacks and similar things are kept in the back compartment, where they are convenient to reach when an installation in the field is undertaken.

On hot days when the sun beats down, shade is provided by a tarpaulin supported above the roof of the trailer. It is really surprising what a difference this makes in the temperature inside. When it rains or

THE EQUIPMENT IN SERVICE
There is ample room for the operator inside the trailer

snows, the tarpaulin is pulled over on one side of the trailer to provide shelter in front of the door. Both windows have screens to keep out insects when the windows are open for ventilation. In winter, the front compartment can be heated by an aerial tent heater for which space has been provided.

Weight of the trailer and equipment is under 2,000 pounds, so that it can be towed, under all but exceptional conditions, by a passenger car or half-ton chassis equipped with a towing hitch. This too is a valuable characteristic, because during emergencies there is need for the heavier maintenance and repair vehicles for use in restoration of wire lines. Moreover, with a small trailer the maneuverability is such that it can be taken into open fields or pastures off the road, which facilitates setting up the radio antenna system.

Units Are Widely Dispersed

IN an emergency, the first consideration is to get radio telephone equipment to a location where it can be employed effectively. With a few equipments held at widely separated points, it might require much time to get them into operation. The alternative is to have a sufficient number of emergency radio telephone equipments in readiness at strategic locations to be able to reach any vulnerable point in a few hours at most. With this ultimate goal in view, the Bell System has consistently pro-

ceeded in recent years, on the basis of experience already obtained, to locate a gradually increasing number of emergency radio telephone terminals at strategic points throughout the country.

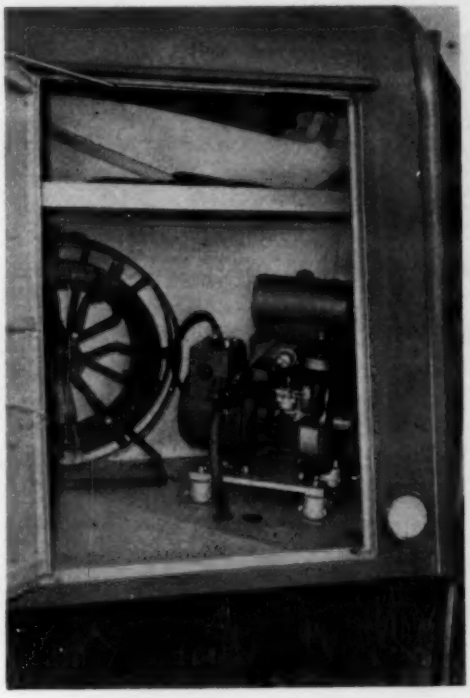
In some instances these points of departure for the equipments are altered on a seasonal basis. For example, during the hurricane season more equipments may be held in readiness along the Atlantic and Gulf Coast areas, while during the winter months these same equipments have new locations in the sleet belt. As spring comes on, they may again be moved into areas which are occasionally subject to floods. In this way the strategic points move about and fewer equipments may be made to do the work that otherwise would require many more. The map on page 229 shows the distribution of equipments by states throughout the country on October 1, 1942. This distribution will doubtless vary somewhat from month to month.

The number of radio telephone equipments now in service, which is over a hundred, is somewhat greater than during 1941 and almost double the number in use in 1940. Under existing conditions, when communication facilities are loaded with business vital to the war and so large a part of the messages handled are essential, there is an even greater need for added protection to service. Provided materials can be obtained, the number of equipments in use next year will be still further increased.

How They Serve in Emergencies

DURING 1940 there were sixteen cases in which emergency radio telephone equipments were employed for restoring service. Causes included a number of sleet storms in the middle west, a mild hurricane in South Carolina, and a forest fire on Cape Cod. The next year there were about two dozen cases of restoration which used emergency radio telephone equipment. In almost all of these cases, radio provided the only means of communication for periods varying from an hour or so to as long as 13 days in the case of a submarine cable across the mouth of the Columbia River which failed in August, 1941.

In addition to the uses of emergency radio telephone equipment following such disasters as are caused by



THE REAR COMPARTMENT

In this separate section of the trailer are the power supply, wire, and miscellaneous tools and equipment

winds, floods, sleet, explosions, and fires, these radio telephone terminals have a day-to-day use in emergencies. A number of examples could be cited, but two may be of interest as illustrative of the kind of thing for which these terminals have been employed.

An oil barge caught in an ice flow in the Hudson River in March, 1941, dragged anchor and severed two submarine cables. A pair of radio telephone terminals was brought into service and in about four days handled over two hundred messages, while repairs to the cables were being made.

Telephone lines from the Pacific Telephone and Telegraph Company connect with the telephone lines in Yosemite National Park near El Portal. During the winter season, there are very severe storms in this vicinity, often followed by landslides and floods in the narrow pass through which the telephone lines enter the park. Experience had shown that, even with the heroic efforts of telephone men and forest rangers to maintain the lines, there were some days each winter when service with the park was disrupted. In order to care for these occasions, emergency radio telephone equipment has been set up in the park and near Merced, California, ready for almost immediate use. There are quite a number of people whose duties require them to live in the park throughout the entire year; and to serve them in emergencies this radio telephone circuit has repeatedly proved its worth, and no extensive isolation has occurred since it was placed in readiness.

Now, as never before in the history of the Bell System, the maintenance of communication is vital to our national well being. The wheels of industry are geared to a new tempo of production for war, to roll out unceasingly the tanks, planes, ships and guns needed by the United Nations. The coördination of this vast productive effort depends in no small part upon telephone service. While it is the duty of everyone to keep the lines open for essential conversations, it is the job of the telephone companies to maintain those lines. Not only does war production depend upon communications for coördination, but to a considerable degree the telephone service supplements the domestic communication services of the military and provides circuits for civilian defense. Radio telephone terminals for emergency use are more important than ever, because in emergencies they will restore vital communication circuits which cannot be re-established so expeditiously by any other means.

THE AMERICAN TELEPHONE HISTORICAL LIBRARY: 20 YEARS OF SERVICE

In Its Collections of Documents and Records Are Preserved Much Of the History of the Development of the Service and the Origins Of the Spirit Which Animates Its Men and Women

By ROBERTSON T. BARRETT

THE American Telephone Historical Library, maintained at the headquarters of the American Telephone and Telegraph Company, 195 Broadway, New York, was twenty years old on October 7, 1942. Had there been an anniversary celebration, it would have been affected by the exigencies imposed by war, for many of the most significant records and relics which normally have a place there, in a large room on the twenty-sixth floor, are now absent.

They are emigrés. Soon after bombs fell on Pearl Harbor, and it became apparent that they might some day fall on New York, the staff of the Historical Library went over the items which make up the various collections and selected the more important ones for shipment to a point outside the city for safe-keeping. All of these documents which have been removed are irreplaceable, and some of them are priceless in the traditions that are written between their lines. And they are missed—as persons are missed when removed from the accustomed places where they have lived their daily lives.

In a sense, it is not difficult to think of each of these documents as having a personality of its own. So much does the written word partake of the character of him who pens it, or with whose life and works it is associated, that it becomes a projection of his own self, a reflection of his spirit. A letter thus becomes a living thing, a hastily scribbled note has a soul, a proclamation or some other public document becomes a personage, re-enacting the great events of which the man who signed it was a part.

True, photostatic reproductions have been substituted for these documents which have been taken from the glass cases of the Historical Library, or removed, with their frames, from its walls. But the art of the photographer and its allied arts of photo-engraving and printing cannot reproduce the personality inherent in original documents. There are thousands of pictures of Magna Charta, but only the original parchments to which King John reluctantly set hand and seal breathe the real drama of what happened at Runnymede on a

A CORNER OF THE HISTORICAL LIBRARY

Although many of the most significant records have been removed "for the duration," much that is of general interest, as well as of value for research, remains. The desk in the foreground was used for many years by Theodore N. Vail

momentous June day in 1215. Reproductions of the Declaration of Independence there are almost without number, but the original alone, with John Hancock's bold signature heading the list of signers, breathes the real spirit that brought a nation to birth.

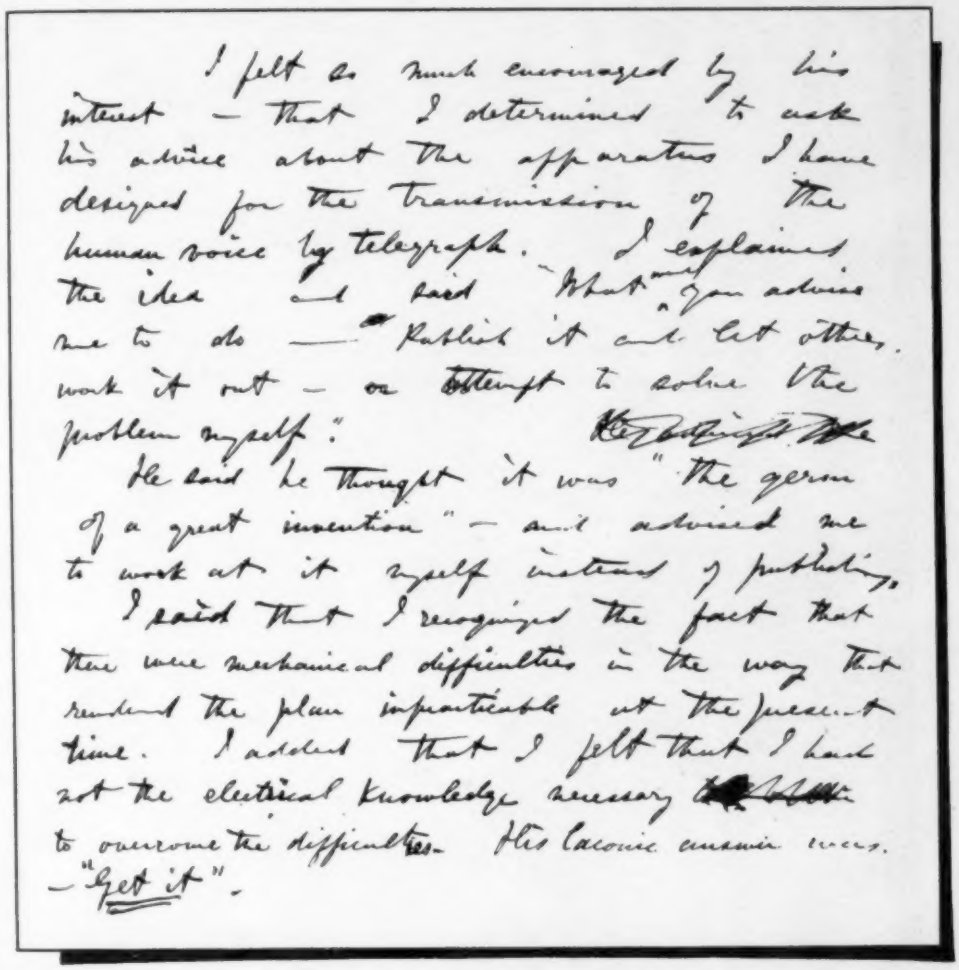
Documents Which Live

AND so it is with some, if not all, of these documents that form the telephone's historical pattern, and that have helped to make the Historical Library what it is—an intimate, revealing place in which, if one is willing to do so, one may rub elbows with the men and women who have moved across the telephone scene. The black-bound notebook in which, under date of March 10, 1876, is recorded the first full sentence of speech transmitted by telephone: "Mr. Watson, come here; I want you!"—that is not just a book; it is the methodical, painstaking, devoted Thomas A. Watson, himself. The Bell Patent is not merely a public document, tied with a ribbon and officially sealed—it is Alexander Graham Bell, thrilling with renewed hope and courage as this patent was allowed to him, on his twenty-ninth birthday. The letters of Theodore N. Vail come alive as one reads them, and stride across the stage of one's imagination in the form of the virile, forthright, far-seeing man of affairs that he was, even in his younger years, and that he remained throughout his career.

Nor are all of the items in the Historical Library of interest or importance because the names with which they are associated are as well known as those of Bell, Watson, or Vail. Some of them tell the simple, unspectacular stories of linemen, cable-splicers, operators or others

who, each in his own way, have played parts in the creation of the telephone service of today and have impressed their own personalities upon it.

It is by no means strange that the American Telephone Historical Library, made up as it is of many thousands of individual items about telephone people, or contributed by telephone people, each reflecting a personality, has a personality of its own that is, as it were, a compound or amalgam of all of these individual personalities. It, too, as well as the multitude of separate documents which make it up, is a living thing, reflecting—or doing its best to reflect—the aims and purposes and accom-



I felt so much encouraged by his interest — that I determined to ask his advice about the apparatus I have designed for the transmission of the human voice by telegraph. I explained the idea and said "What do you advise me to do — Publish it and let others work it out — or attempt to solve the problem myself."

He said he thought it was "the germ of a great invention" — and advised me to work at it myself instead of publishing.

I said that I recognized the fact that there were mechanical difficulties in the way that rendered the plan impracticable at the present time. I added that I felt that I had not the electrical knowledge necessary to overcome the difficulties. His laconic answer was. — "Get it".

"THE GERM OF A GREAT INVENTION"

In a letter to his parents in Canada in 1875, reproduced in part above, young Bell relates how Joseph Henry, the famous scientist, encouraged him to acquire the electrical knowledge necessary to carry on the experiments which resulted in the invention of the telephone

No. 174,465

The United States of America

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas Alexander Graham Bell, of Salem, Massachusetts

has presented to the Commissioner of Patents a petition praying for the grant of LETTERS PATENT for an alleged new and useful

Improvement in Telegraphy

a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of Law in such case made and provided: and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a Patent under the Law:

Now therefore these LETTERS PATENT are to grant unto the said Alexander Graham Bell, his heirs or assigns for the term of seventeen years from the seventh day of March one thousand eight hundred and seventy-six, the exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this seventh day of March in the year of our Lord one thousand eight hundred and seventy-six and of the Independence of the United States of America the one hundredth.

Countersigned

Secretary of the Interior

Commissioner of Patents

"IMPROVEMENT IN TELEGRAPHY"

This is the basic telephone patent, which was granted to the young inventor on his twenty-ninth birthday, and formally issued four days later

plishments of all the men and women who, from the beginning, have helped in any way, little or large, in the making of the history that is here preserved.

IT seems almost needless to add that, if the Historical Library has a personality, as the writer likes to believe that it has, this personality reflects that of those who brought this collection of memorabilia into being and who, throughout the past twenty years, have had a hand in helping it to become what it now is. Behind the collection that makes up the American Telephone Historical Library there is and always has been a very specific and concrete purpose; a philosophy that has been at once deep-laid and well defined.

That purpose and that philosophy have been directed toward making what has been here collected a useful instrumentality of service. Every document here preserved has been kept on the basis of its possible usefulness as a means of helping to tell truthfully the romantic story of the development of the telephone. Which is not to say that all items are of equal importance. Some have been momentous in their implications, far-reaching in the results which they have helped to achieve. Some are seemingly trivial, and serve only to throw additional light on the men and women who have made telephone history, or upon the innumerable little incidents or episodes which, taken together with the greater events, have gone into the making of the telephone service of today.

In its main essentials, this purpose was from the beginning what it is today: to preserve and perpetuate the documentary evidence of telephone history; to place the more striking and important of these pieces of evidence on display, where they may be of interest to those of the telephone-using public who see them, and of inspiration to telephone men and women; to make these and other documents available, under proper restrictions, for the use of students of telephone history, whether from the ranks of telephone people or outside them; and to provide facilities for those who wish to do so to see the story of telephone development, not merely as a series of unrelated events, nor as a mingled crowd of people whom the passage of time has robbed of personality, but as a continuous process in which the telephone men and women of today participate equally with others of earlier generations who were as human as they are.

A Philosophy of Service

BUT while the main purpose of what is now called the American Telephone Historical Library was doubtless clearly defined in the minds of those who created it, the philosophy that lies behind what is there done was not brought into being, as Minerva was said to be, full grown. Like all worth-while philosophies, it has been the product of evolution, increasing in scope as experience has expanded its horizons. In order to trace the steps in this evolution, it will perhaps be helpful to review the history of the Historical Library itself.

What is now the American Telephone Historical Library began officially on October 7, 1922, when H.

B. Thayer, then President of the American Telephone and Telegraph Company, appointed William Chauncy Langdon to the newly created position of Historical Librarian—of a non-existent library. Such library as there was did not even have that name, as will presently appear. At first, the space assigned to the new appointee—a small room, bearing the number 2611–C, which still designates the Historical Library, but occupying only about half the area now devoted to it—contained only a desk, some chairs, a few filing cabinets. But it had about it an atmosphere surcharged with enthusiasm.

Early Interest in the Project

IMPETUS had been given to this enthusiasm by the very real and personal interest shown in the project, from the time it was suggested, on the part of Mr. Thayer. His own career as a telephone man had begun in 1881, when he became a shipping clerk in the Western Electric Company, at Chicago, and it was doubtless in part because of his association with the events of early telephone history that this interest continued not only while he was President, but to the end of his life. But enthusiasm for the historical aspects of telephone development is not necessarily related to the date upon which one's telephone career began, as is evident from the fact that, as Mr. Thayer's successor, President Walter S. Gifford has also taken a personal interest in the work of the Historical Library, and has donated to it not a few interesting and important items.

It is appropriate to say that, but for a personal regard for the success of what the Historical Library was intended to accomplish, on the part of some of the men who have played important roles in the making of telephone history, no real measure of such success could have been achieved.

Among those who, in addition to Mr. Thayer, early coöperated in the building up of the Library, both through their personal interest and inspiration and by making valuable donations to it, were Mrs. Gilbert Grosvenor and Mrs. David F. Fairchild, daughters of Alexander Graham Bell and granddaughters of Gardiner G. Hubbard, one of his two principal business advisors; the family of Thomas Sanders, who provided much of the financial support that enabled Bell to carry on his telephone experiments; Thomas A. Watson, his mechanical assistant in the early days of his struggle to bring his invention to success; Thomas D. Lockwood, for many years an authority on telephone patent matters and other phases of telephone history; John J. Carty, who began his telephone career as a boy operator in Boston in 1879 and rose to a position of world-wide recognition as a leader in the field of telephone engineering, and many others.

ALTHOUGH Mr. Langdon had himself selected the title of Historical Librarian,* as against that of "Historian," to which consideration had been given, the one-room domain over which he presided was not called a library. It was known as the Ameri-

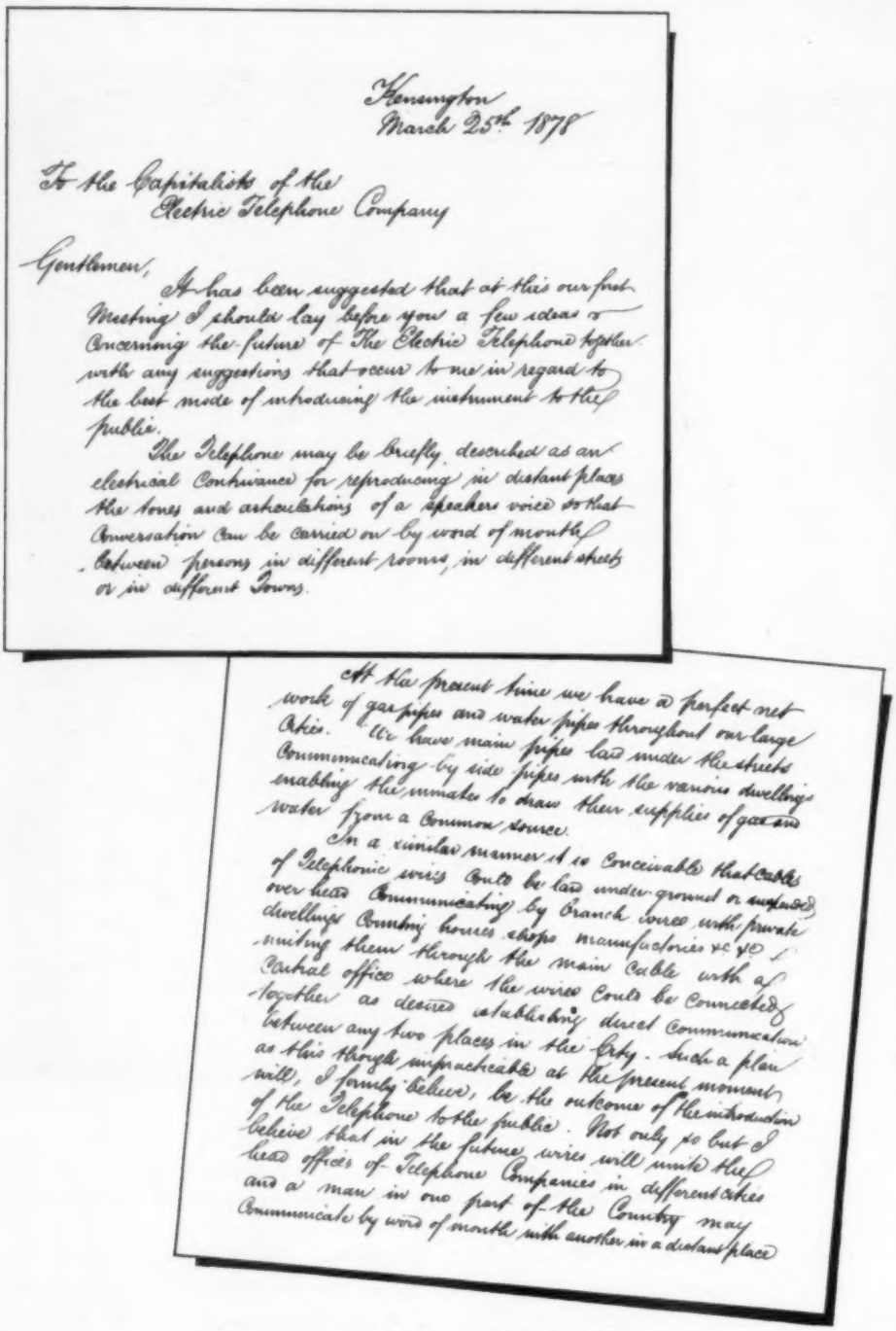
* Mr. Langdon retired in 1936, and was succeeded as Historical Librarian by the present writer.

THOMAS A. WATSON'S NOTEBOOK

In it Bell's young assistant kept a methodical record of their progress. On the lower right page is noted verbatim the first complete sentence of speech ever transmitted electrically

can Telephone Historical Collection,* and this name was retained until it was changed in 1933 to the American Telephone Historical Library. The original name was perhaps more significant than might appear on casual consideration. The first and most important task of the librarian was obviously that of a collector.

* See "The American Telephone Historical Collection," BELL TELEPHONE QUARTERLY, January, 1924; "The Growth of the Historical Collection," QUARTERLY, April, 1925.



Kensington
March 25th 1878

To the Capitalists of the
Electric Telephone Company

Gentlemen,

It has been suggested that at this our first Meeting I should lay before you a few ideas & Concerning the future of The Electric Telephone together with any suggestions that occur to me in regard to the best mode of introducing the instrument to the public.

The Telephone may be briefly described as an electrical Contrivance for reproducing in distant places the tones and articulations of a speakers voice so that Conversation can be carried on by word of mouth between persons in different rooms, in different streets or in different Towns.

At the present time we have a perfect net work of gas pipes and water pipes throughout our large Cities. We have main pipes laid under the streets Communicating by side pipes with the various dwellings enabling the inmates to draw their supplies of gas and water from a common source.

In a similar manner it is Conceivable that Cables of Telephonic wires Could be laid under ground or suspended over head Communicating by Branch wires with private dwellings Country houses shops manufactories &c &c & uniting them through the main Cable with a Central office where the wires Could be Connected together as desired establishing direct Communication between any two places in the City. Such a plan as this though impracticable at the present moment will, I firmly believe, be the outcome of the introduction of the Telephone to the public. Not only so but I believe that in the future wires will unite the head offices of Telephone Companies in different Cities and a man in one part of the Country may Communicate by word of mouth with another in a distant place

INTRODUCING THE TELEPHONE IN ENGLAND

These are extracts from a prospectus which Bell presented to British capitalists in 1878. In the lower section is found his prophetic statement of the service which the telephone could render to mankind

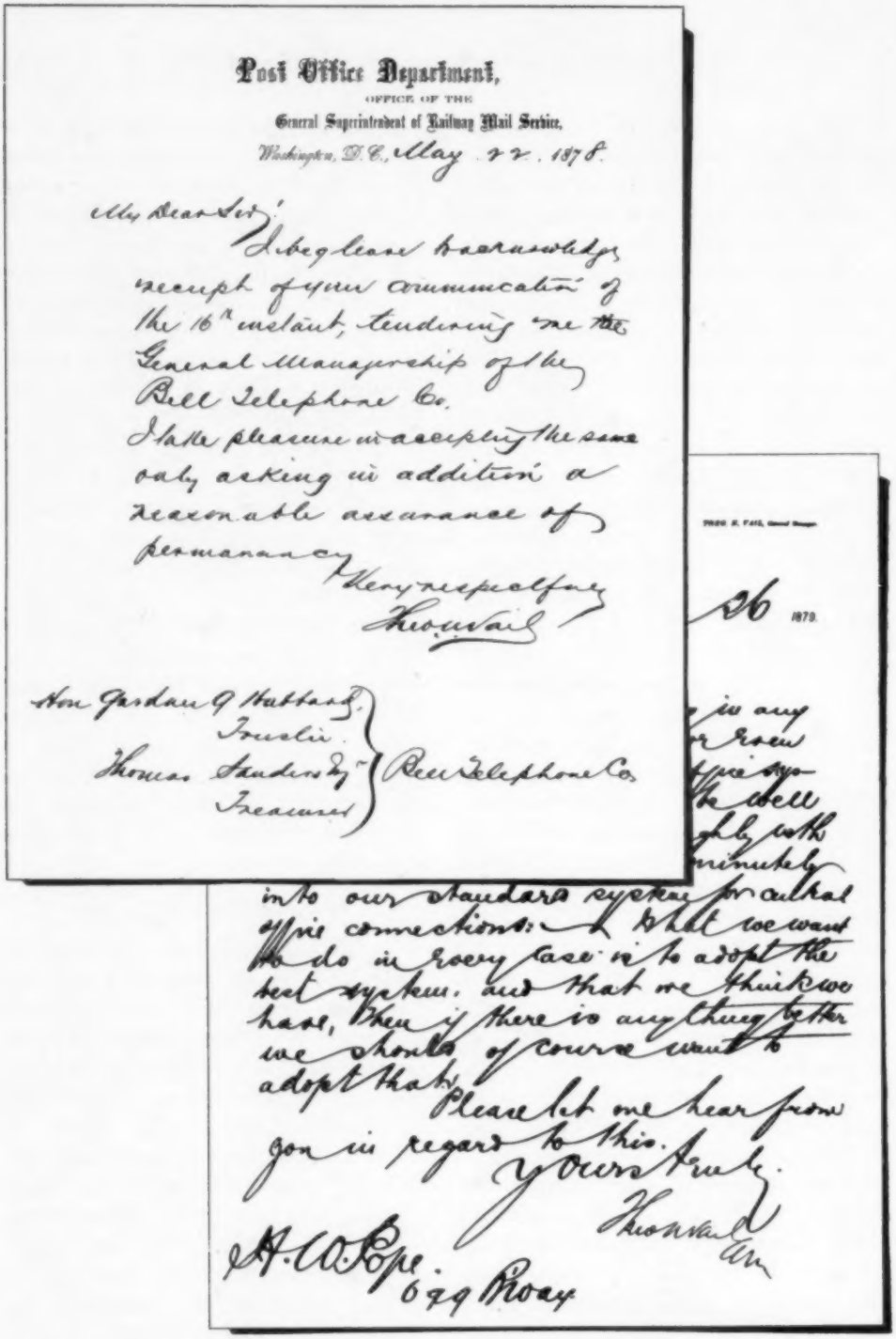
For this function Mr. Langdon was admirably fitted. He was a collector by instinct, and—so far as the collection of historical data was concerned—a collector with a purpose. Already well grounded in telephone history by reason of his activities as a writer on the staff of the Information Department of the American Telephone and Telegraph Company, he knew what would, and what would not, be of value to the collection he was to build up, from the standpoint of its purposes as already outlined.

HE had what amounted to a reverence for the great documents of telephone history: the Bell Patents; the mortgage made by the mother of Enos M. Barton in order that her son might purchase an interest in what later became the Western Electric Company; Watson's notebook, in which he recorded the first transmission of a full sentence of speech, on March 10, 1876; the first telephone advertisement, probably penned by Hubbard; and some of the more intimate letters or memoranda of the great figures of the telephone's early days. But he knew also, as any man with an historical instinct must know, that many seemingly trivial incidents, in which the actors were plain, ordinary people, had a part in the making of telephone history. And he therefore set himself to collect the reminiscences of such people, as well as those whose names were better known—all to the end that, by fitting these bits of history together, like the pieces of a mosaic, the student of the telephone's past might see it in proper perspective and in its entirety.

The custodian of the newly created American Telephone Historical Collection had, too, what might be called an inspired acquisitiveness—coupled with no little ability as a follower of faint trails. Once on the track of an item he wanted for the Historical Collection, he was never content to rest until he had traced out its whereabouts and—sometimes after adroit persuasion—obtained the consent of its owner to donate it for permanent preservation among the memorabilia of the telephone. And he had a deep-seated prejudice against throwing away anything, once acquired, until it had been thoroughly demonstrated to be of no historical or practical worth. The value of this instinct for preserving the seemingly unimportant is now demonstrated almost daily, when some document, filed in the Historical Library years ago, is called upon to settle some obscure or mooted point in telephone history—sometimes in matters in which the point in question is of vital moment.

Valuable Papers Rescued

THE records show that the Historical Library came into existence because two other men had developed and made use of this same penchant for collecting and preserving information that, in later years, proved to be of historical importance. Back in 1883, Thomas D. Lockwood had the foresight to perceive that it was then, or sometime would be, valuable to collect information as to the beginnings of the telephone business in various parts of the country. He painstakingly gathered such reports for twenty-three American cities. For years, these reports reposed in the archives of the American Telephone



Post Office Department,
OFFICE OF THE
General Superintendent of Railway Mail Service,
Washington, D. C., May 27, 1878.

My Dear Sir:

I beg leave hereby to acknowledge receipt of your communication of the 16th instant, tendering me the General Managership of the Bell Telephone Co.

I take pleasure in accepting the same only asking in addition a reasonable assurance of permanancy.

Very respectfully yours
Theo. Vail

Hon Gardiner G Hubbard
Prest.
Thomas Sanders Esq
Treas.
} Bell Telephone Co.

26 1879.

in to our standard system for all of its connections. What we want to do in every case is to adopt the best system, and that we think we have, then if there is any thing better we should of course want to adopt that.

Please let me hear from you in regard to this.

Yours truly.
Theo Vail

A. A. Pope.
629 Broadway

TWO SIGNIFICANT LETTERS

Above: Theodore N. Vail relinquishes the position of General Superintendent of Railway Mail Service to become General Manager of the infant Bell Telephone Company. Below: In 1879 he enunciated what has long been recognized as a part of the Bell System's fundamental policy:—"What we want to do . . . is to adopt the best system . . ."

and Telegraph Company in Boston. When a general weeding-out process was undergone preparatory to moving the headquarters of the Company to New York in 1907, these old reports seemed, to some of those who were doing the weeding, to be of no particular value.

But they were rescued from the limbo of lost things by J. A. Gately, later for many years chief clerk of the Patent Department, who personally brought them to New York, and kept them in his desk. One day he showed them to Mr. Langdon, who in turn brought them to the attention of James D. Ellsworth, then head of the Information Department. Finally, they were shown to Mr. Thayer, who soon after made the decision that led to the establishment of what is now the Historical Library.

THIS was by no means the first step taken by the Bell System in the direction of the perpetuation of its history and traditions. As early as 1912, John J. Carty, who had become Chief Engineer of the American Telephone and Telegraph Company, took action which led to the establishment of the Bell System Historical Museum,* at 463 West Street, New York. Under the able direction of Wilton L. Richards, and later of William C. F. Farnell, a remarkably complete collection of telephone equipment has been assembled and is now on display. From a piece of the original wire over which Bell spoke the first sentence transmitted by telephone, and replicas of his early instruments, down to the latest developments in apparatus design, the physical aspects of telephone history are here displayed in case after case of exhibits that are not only of interest but of inspiration.

Mr. Thayer must have seen, however, that instruments and other mechanical devices do not and cannot tell the complete story of telephone development—that as romance and drama, that story is only half told unless it includes that which reflects policies, principles, and human personalities. It was, then, to supplement what had already been attempted in establishing the Bell System Historical Museum that authority was given for beginning what has since grown into the American Telephone Historical Library.

To the papers which Mr. Lockwood had originally collected and which Mr. Gately had preserved throughout the years, more were added as the purpose of the Historical Collection was brought to the attention of others who had pioneered in telephone development, or in some cases, of their relatives after their death. The business of collecting material went on without interruption, is still going on, and will continue to go on as long as telephone men and women keep on doing things that make telephone history.

What the Library Contains

THE Historical Library now contains some 25,000 items. Space does not permit the inclusion in this article of anything that even approximates a list of the types of documents that make up the various groups. But it may be well to indicate in broad terms the nature of these records.

* See "The Bell System Historical Museum," BELL TELEPHONE QUARTERLY, July and October, 1936.

The Telephone.

THE proprietors of the Telephone, the invention of Alexander Graham Bell, for which patents have been issued by the United States and Great Britain, are now prepared to furnish Telephones for the transmission of articulate speech through instruments not more than twenty miles apart. Conversation can be easily carried on after slight practice and with the occasional repetition of a word or sentence. On first listening to the Telephone, though the sound is perfectly audible, the articulation seems to be indistinct; but after a few trials the ear becomes accustomed to the peculiar sound and finds little difficulty in understanding the words.

THE FIRST TELEPHONE ADVERTISEMENT

The "proprietors" make modest claims for Bell's invention which contrast with its accomplishments in later years

In addition to original documents which are of obvious importance, such as the Bell Patents and the records of the many bitterly contested suits that grew out of them, there are found original letters of Bell, Hubbard, Sanders, and Watson, together with the latter's notebooks, kept not only when he was assisting with the experiments which led to the invention of the telephone, but during the period when he was, in effect, the entire "Engineering Department" of the telephone company, and went about the country advising the licensees who were starting telephone exchanges as to how they might meet their technical problems.

THERE are collections of early telephone directories from the larger cities of the United States, and some from smaller towns, all of which afford, by contrast, striking proof of the rapidity with which the telephone business has grown in popularity and use during its relatively short existence. There are scrap-books filled with contemporary clippings saved by those who played large or small parts in bringing about this remarkable growth.

There are two postal cards, of no apparent importance until it is realized that they are the reports of the first day's work done on the New York-Philadelphia line—the real beginning of the creation of today's nation-wide network of long distance telephone facilities. There are photographs and newspaper clippings that tell of great emergencies, like the blizzard of 1888, the San Francisco earthquake and fire, and the great floods which have swept the valleys of the Ohio, the Mississippi, the Connecticut and other rivers.

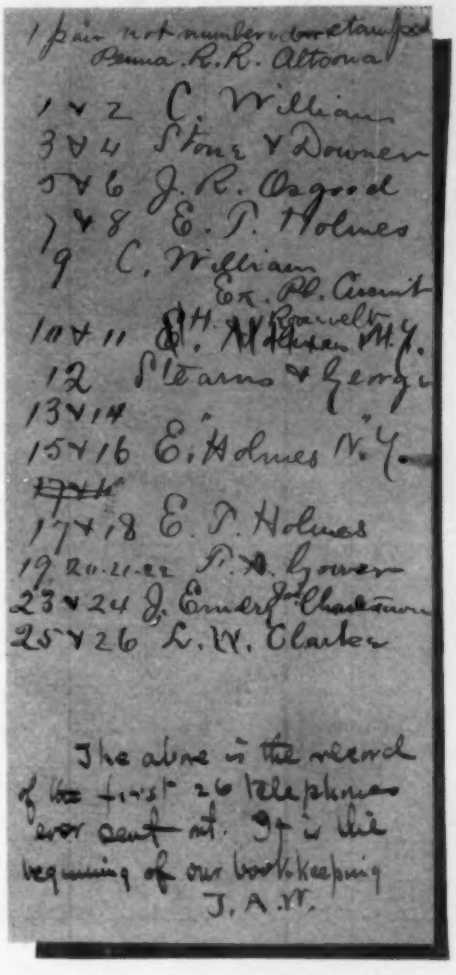
There are comprehensive records of the part which telephone men and women played in the first World War, together with a letter to Mr. Vail from Postmaster General A. S. Burleson, expressing the latter's appreciation for the coöperation re-

ceived during the war years "in the interest not alone of this important service as a whole, but of the government of your country as well."

There are awards, certificates, or medals bestowed upon Bell and other individuals in recognition of their contributions to progress in the scientific field. There are similar awards to Bell System organizations, many of them issued in connection with expositions at which exhibits of telephone equipment held important places.

Finally, there are the personal reminiscences of many of the men and women who have helped to make telephone history. Written with no attempt at literary perfection, these are the simple stories of plain people, telling in their own words what they saw and what they did when the telephone was young. Not a few of them were based on notes taken by Mr. Langdon's secretary as he sat and talked informally with visitors whose memories of pioneer days are here recorded. It is of interest to note that Thomas A. Watson's remarkably interesting book, "Exploring Life," grew out of a manuscript prepared by him, originally intended only for preservation in the Historical Library.

And so it goes, from documents momentous in their importance at the time they were penned, and still of the highest significance, to scraps of paper on which some casual memorandum was made at a time when it did not seem to be of particular historical interest. Taken together, these items which make up the Historical Library afford—for those who care to study them thoughtfully—a means of re-creating the story of the telephone from its very beginning to the present.


1 pair not numbered not stamped
Penna. R.R. Altoona
1 & 2 C. William
3 & 4 Stone & Downer
5 & 6 J. R. Osgood
7 & 8 E. T. Holmes
9 C. William
Ex. PO. Assist
10 & 11 S. H. Roswell
12 Stearns & George
13 & 14
15 & 16 E. Holmes N. Y.
17 & 18 E. T. Holmes
19 20. 21. 22 T. A. Gower
23 & 24 J. Emery Jr. Chadwick
25 & 26 L. W. Clarke
The above is the record
of the first 26 telephones
ever sent out. It is the
beginning of our bookkeeping
J. A. W.

BOOKKEEPING BEGINS

The note below this list of telephones bears the initials of Thomas A. Watson

Other Historical Functions

BUT long before the name of the American Telephone Historical Collection was abandoned, it had become apparent that the function of merely collecting historical documents and other data was by no means the

AMERICAN TELEPHONE HISTORICAL LIBRARY

VISITORS BOOK

NAME	ADDRESS	ORGANIZATION
	Blizzard of 1888	
	Exhibit	
	March 10, 1938	
James E. Lynch		Legal Dept. AT&TCo
John C. Latham	27 West 55th St. Myk.	Inf. Dept AT&T. Co.
Helen I Compton	58 Browning Ave Trenton N.J.	Inf Dept AT&T Co
	March 11, 1938	
Angus A Macdonald	236 Bay State Road Boston	Am Tel & Tel Co Boston
Jean M Schaffer	315 East 16th Street	AT&T. - Treasury
Kathryn J. Jeffe	Ridgewood, N.J.	A.T.&T. - O&E
John Stange	134 Sherman Ave Jer City N.J.	N.J. Tel Rpt
~~Walter Speight~~	195 Broadway	AT&T Co
F. S. Miller	32 Fifth Ave.	"
J. R. Kipatrick	140 West St	N. Y. Tel. Co.
Arthur W Page	195 Broadway	AT&T Co
R. C. Bishop	Rutherford, N.J.	Reed & Prince Mfg Co.
~~H. B. Sellers~~	140 West St.	N.Y. Tel Co.
Lindsay Rhodes	12 Pinehurst	N.Y. Times
Mrs. P Bauman	195 Broadway	N.Y.C.
Laura M. Smith	" "	"
Jean S Bradley	" "	"

A PAGE FROM THE VISITORS BOOK

On the occasion of an exhibition observing the fiftieth anniversary of the "Blizzard of '88," the first to sign under the date of March 11 was Angus A. Macdonald, who patrolled the New York-Boston lines on snowshoes outside of Boston during that storm, and subsequently posed for the well known painting, "The Spirit of Service." Third name below his is that of John Stange, who similarly maintained the service near New York. Other names familiar to Bell System people appear on the same page

only one that was here to be performed. Although Mr. Langdon had modestly eschewed the application to him of the title of Historian, there was hardly a day in which he was not called upon to act as such—to collate, as well as to collect, historical data; to evaluate them as to their accuracy; to see them in their proper relationship to each other; to interpret them in terms of their bearing on the telephone service of the present and the future.

THIS function of interpretation has become one of increasing importance. Year by year it has become more and more apparent that the documents which the Historical Library contains are not chiefly important as individual records, but as facilities by which, guided by the Library staff, a student who cares to do so may correlate all these bits of history in such a way as to make clear to later generations of telephone people and telephone users just how a nation-wide telephone service has come into being.

Such interpretation has been made the more necessary by the passage of time and all that it involved. Practically all of the men and women who played parts in telephone development in its earlier days have retired from the service; many have died. New actors have taken their place upon the stage. Employees—most of them young men and women—join the telephone family by thousands each year. And most of them have had little or no opportunity of learning, in advance of their employment, anything about the beginnings from which has come the great public service in which they are engaged.

Many opportunities for such interpretation present themselves to the members of the Historical Library staff in the course of a year. Visitors at the Library are given individual attention, and the more significant exhibits are explained in as much detail as may seem desirable, this depending largely upon the direction in which the interests of the listener appear to lie. Incidentally, a register of visitors, which has been kept since the Historical Library was opened, contains the names of people from many lands, not a few of whom hold distinguished places in the fields of science, inventions, the arts, and public affairs. Most of those who spend some little time in the Library, whether they are telephone people or otherwise, leave with a word of appreciation, and not a few confess to having learned a lot that they had not known about telephone development.

Answering Inquiries

PERHAPS more important is the steady flow of inquiries that reaches the Historical Librarian. These range from relatively simple questions on the part of public school pupils who are preparing "projects" to those of candidates for post-graduate degrees who are writing theses. One letter or telephone call may ask only that a name and address be checked in an old telephone directory; another may require hours and even days of research before a satisfactory answer is found.

Authors of novels or short stories call to find out whether it would have been possible, in 1897, let us say, for the hero at Detroit to call the heroine,

at Jacksonville, Florida, on the long distance telephone, usually requesting, in addition, the necessary details as to whether he was likely to talk over a wall telephone, and whether he had to "turn the crank" to get the operator. Supplying material for and subsequently checking of magazine articles and scripts for radio sketches and moving pictures touching on the history of the telephone is another matter of routine that requires a considerable part of the time of the Library staff.

Not infrequently the material sought has a most direct and important bearing not only on telephone history, but on the telephone business of the present day. Within recent months, for example, a matter was before one of the government commissions in Washington in which it was highly desirable to establish what the early policy of the Bell System was as to a commercial practice now widely followed. Search elsewhere having failed to provide sufficient evidence, the files of the Historial Library were examined, and after considerable handling of old letter books, the desired evidence was found in a memorandum dictated by Theodore N. Vail more than sixty years ago.

With telephone development, as with everything else that is not static and lifeless, the past and the present are inextricably mixed and merged. One cannot understand the telephone service of today—and, indeed, one cannot contribute to the full his share of the provision of that service—without knowing something of the planting of the acorns from which this great oak has grown.

Unsung Heroes of History

BUT telephone history consists not alone of the words and deeds of the great figures who in their time have occupied the center of the stage. It has been written—as it is being written today—by thousands of men and women who in unspectacular and almost obscure ways have contributed toward the quality of the service in their own day, and to its improvement for all time.

Not all of the boy operators who were associates of John J. Carty in Boston when he began his telephone career rose to the position of large responsibilities which he achieved. But even the least of them made his own impress upon the overall growth and betterment of telephone service. Not every woman operator has "glorified her calling by sacrificing her own life, that others might live," as did Sally Rooke, when flood waters swept down on her little central office in Folsom, New Mexico, in 1908. But every woman who has done her work at the switchboard or elsewhere to the best of her ability has contributed something to the story of the telephone.

Not every lineman has guarded essential communication lines on snowshoes, as did Angus MacDonald during the blizzard of 1888, and won lasting fame as the original model of the best known of telephone pictures —"The Spirit of Service." But every lineman makes history when, in that same spirit, he does as well as he can what it is his to do. History is the sum of a multitude of acts like these. And because such acts are being done, day in and day out, in the telephone service today, the history of that serv-

ice is a living, dynamic thing that never grows too old to be of interest and of inspiration.

One who has made even a feeble attempt at the interpretation of telephone history—who has made any effort at all at the job of trying to see telephone history in its broader aspects—would be struck with a sentence or two in a recent article by Roy F. Nichols on "Confusions in Historical Thinking." * This writer points out:

> ". . . The kind of interpretation of past events does not depend so much upon research as upon the way in which the historian interprets present events, views the world around him, and judges the character and motives of those with whom he comes in contact. . . . In other words, one is no better historian than he is citizen of the world."

PERHAPS one does not need to qualify as a "citizen of the world" in order to take a somewhat similar view of telephone history, or to write about it—or to play his part in the making of the telephone history of today. It may not be necessary for him to reflect that the telephone is now world-wide in its reach, and that what he thinks or writes or does may have far-felt effects. But certainly he cannot well fail to think as clearly as he can upon the relationship between the telephone's past, its present, and its future—to see the telephone service of today in what might be called time-perspective. Whatever is his to do will be done the better if he will pause to reflect that, the minute it has been done, it becomes a part of telephone history, and thereby reaches far into the past—and even farther into the future.

The provision of such a time-perspective is, as the writer views it, the purpose of the American Telephone Historical Library. Its philosophy, built up by a process of evolution extending over a period of twenty years, is a simple one—that all that has been is a dynamic part of what is, or is to be. Touched by this philosophy, even the driest and dustiest of documents comes to life, and takes its place in the provision of telephone service in these troublous days when communication plays so important a part in preserving America and the American way of life.

* Journal of Social Philosophy and Jurisprudence, Vol. VII, No. 4, July, 1942, page 334.

FIRST AID TRAINING IN THE BELL SYSTEM

More Thousands of Employees than Ever Are Taking It and Are Teaching It, and a Recent Joint Agreement with the American Red Cross Assures Up-to-date Methods and Procedures

By ERLE S. MINER

PLAYING their regular positions on the "Bell System team of 400,000" to win this war, telephone men and women have also shown their eagerness to buy bonds, to conserve rubber, to "get in the scrap," to take every step by means of which the home front can contribute to victory. And since Pearl Harbor, increased thousands of them have taken first aid training.

These new "first aiders" come from all departments and from all levels of the organization. Because of their training, they are now prepared to serve more effectively as air raid wardens, nurses' aids, auxiliary firemen and policemen, and in other civilian defense activities. Many of them, further, are competent to instruct Red Cross classes in their respective communities—and are so doing.

This sharp acceleration in Bell System first aid activity is significant. During recent years, about 7,000 employees have qualified for first aid certificates annually. In the seven-month period following our entry into the war, *more than 16,000 employees* completed their training. More than a third of all the employees in the System, it is estimated, have now had first aid instruction. What is more, there are in the System approximately 2,500 qualified first aid instructors.

Not least among the benefits of first aid instruction is the fact that in telephone buildings throughout the System there now are trained rescue squads, ready to assist in evacuating designated areas—including transportation to shelter if enemy attack should necessitate evacuation of certain offices—in rendering necessary first aid, and in giving care thereafter. Because of long experience in first aid work, the Associated Companies were able in short order to plan for the care and protection of their own people who are the guardians of the Bell System's communication service of a nation at war.

Nor is it a negligible accomplishment that most of the thousands of Bell System men who are now in the armed forces have had first aid training.

It is apparent that the Bell System

is rapidly becoming an army of "first aiders," ready for duty in an emergency.

The activity is not new to the System, however. Actually, it was first introduced 30 years ago with the assistance and coöperation of the American Red Cross, primarily as an accident prevention measure in the plant departments of some of the Associated Companies of the System; and during three decades hundreds of telephone men and women have demonstrated their ability to lessen suffering and to render practical assistance in case of accident or sudden illness before the services of a physician could be obtained.

In those 30 years the importance of first aid training in the Bell System has increased, and the close and continuing coöperation between the System and the Red Cross has been exemplified by many developments and improvements incorporated in the training program.

A New Look at First Aid

THE extent of first aid training within the Associated Companies has varied somewhat from year to year, largely in ratio with the number of new employees entering the business. During the depression of the early 'thirties, when few were being employed, there was less than usual activity. More recently there has been a definite revival of interest, not only in training new employees but in providing review courses for those who had received their instruction some years before.

This renewed activity raised a number of questions which during 1940 made it desirable to take a broad look

"FROM ALL LEVELS OF THE ORGANIZATION"

This is a first aid certificate issued jointly by a Bell System company and the American Red Cross

at first aid in the light of past experiences, particularly as to what plans should be made for a continuing program. It was evident that procedures based upon such a review should lead toward greater uniformity in first aid training in the Bell System, and with it an increase in the effectiveness of all its benefits.

One point to receive particular consideration was the development of a working arrangement, in effect a joint agreement, with the American Red Cross, to which all the Associated Companies might subscribe. Some of them had been operating under Red Cross agreements executed during the early 1920's, and others had not. The new joint agreement, which is made possible by virtue of the medical supervision provided within the Bell System and the long standing relationships maintained with the Red Cross, was ratified during the latter part of 1940 after consultation between the Red Cross and all of the Associated Companies.

SPECIAL EDITION

This standard Red Cross instruction text has a special cover and a foreword addressed to Bell System employees

The agreement covers first aid instruction and certification procedures which meet the standards and carry the endorsement of the American Red Cross, and provides for training and certifying Bell System first aid instructors and for means to keep both instructors and regular "first aiders" up-to-date in the latest first aid methods.

IN order to place the new joint agreement in operation, representatives of the Red Cross and the Associated Companies met in a series of four joint regional conferences, held during September and October of 1941 in Princeton, New Jersey; Roanoke, Virginia; Chicago, Illinois; and San Francisco, California.

One purpose of these conferences was to give representatives of the Red Cross and the Bell System, who are jointly to administer the first aid agreement, opportunity to familiarize themselves with the methods for doing so. Another important purpose was to train and qualify a number of telephone company representatives who had been selected for supervising instructors. In all, 185 telephone company men, including general plant employment supervisors and safety supervisors and 55 Red Cross representatives, from the entire United States, attended the four meetings.

In addition to covering the terms of the joint agreement and training the Associated Company supervising instructors, the meetings enabled the representatives of the Red Cross and the Bell System companies to become acquainted, so that during the years to come they may all have an understanding of the joint problems involved. The conferences were invaluable in enabling the telephone company representatives to place the new agreement in operation in their respective companies.

Some Results of the Joint Agreement

THE blue-covered Bell System "First Aid and Health" textbook, which was issued in 1927, had become considerably out-of-date. The Red Cross is in a position to revise its first aid text periodically to include improvements in first aid procedures as they are developed, and it has been adopted for Bell System use. Moreover, the adoption of the Red Cross textbook makes it unnecessary for the hundreds of telephone company instructors who also teach first aid classes organized by local Red Cross chapters to refer to one textbook for teaching telephone company classes and to another text for non-employee classes.

The Red Cross textbook used for telephone company first aid instruction is bound with a special cover, and contains a "foreword for Bell System employees" co-signed by Mr. Harold F. Enlows, Director of First Aid and Life Saving Service of the American Red Cross, and by Dr. C. H. Watson,

Medical Director of the American Telephone and Telegraph Company.

Thus the Red Cross textbook is being used as the basis for all Bell System first aid training, and the joint agreement provides that each employee pursuing the course shall have a copy. In classes composed wholly of Bell System employees, however, this text may be supplemented by additional information covering procedures and techniques that experience has proved to be particularly applicable to the needs of the Bell System.

THE Red Cross standard course is the basic course regularly offered to telephone employees. Twenty hours of training are required—with whatever reasonable additional time may be necessary in the judgment of the instructor. For effective teaching, classes are limited to not more than 20 students. Upon successful completion of the standard course, joint Red Cross-Telephone Company first aid certificates are issued.

The advanced course is a ten-hour course providing additional study and practice beyond the standard course. It includes, in addition to a review of the knowledge of first aid acquired in the standard course, a number of practical problems designed to develop further the first aider's skill. Enrollment in the advanced course requires previous qualification in the standard course and, upon its successful completion, advanced course certificates are issued jointly by the American Red Cross and the telephone companies. This course was not provided for in the previous arrangements with the Red Cross.

Another significant change with respect to the certificates of proficiency in first aid concerns the length of time during which the certificates are valid. Under the former procedure, certificates were issued to each employee-graduate of the standard first aid training course, but these certificates carried no expiration date. Now, all standard course certificates expire at the end of a designated period. Then the employee may enroll in the advanced course, and upon completing it may receive the advanced course certificate—which places him in good standing for another similar period. He may then again take the advanced course, and so on for subsequent periods. In this way the individual employee's knowledge of first aid, and his skill in administering it, will be given a definite continuity.

IT is generally recognized that the success of any training program depends largely upon the abilities and sincerity of the instructors. They must not only possess the necessary knowledge and skill, but they must also know how to teach and have the necessary equipment for proceeding with the instruction. Since most of the telephone company first aid instructors teach only a limited number of classes each year, it seemed particularly important to include in the joint agreement procedures for assur-

SPOTLIGHT ON EQUIPMENT

Here are three sizes of Bell System first aid kits: the tools which help the telephone first aider to apply his knowledge and skill

WOMEN EMPLOYEES SHOW THEIR PROFICIENCY
These first aid students represent various departments of an operating company. Two instructors train a group of this size

ing that the corps of Bell System first aid instructors are properly selected, thoroughly trained as instructors, given "refresher" work, and kept currently up-to-date on the latest first aid practices and teaching methods.

In order to be eligible to attend the instructor training course, candidates must have completed the standard and advanced courses. Upon the successful completion of the Instructor's course, joint Red Cross-Telephone Company instructor certificates are issued and are good for one year. The appointment of instructors is on an annual basis, renewable upon approval by the Red Cross provided the instructor has taught at least one class under his previous year's appointment and has satisfactorily availed himself of any review work to which he may be assigned. The emphasis in this review work is upon such matters as new procedures, text clarification, class organization, teaching problems and methods, et cetera.

The American Red Cross has also developed an instructor's outline, and its use by Bell System instructors helps to insure uniformity of instruction, and also relieves the companies of preparing and maintaining their own outlines.

WITH the approval of the Red Cross and as provided for in the joint agreement, the Associated Companies have generally selected one or more supervising instructors. They are chosen from among the active instructors, and have a background of thorough Red Cross first aid training and outstanding first aid teaching experience. Their function is to assist in all the problems of administering the training program within their organizations, so that high standards of first aid training will be maintained.

These supervising instructors include several women, who assist in administering the training among the women employees in departments other than the plant. Arrangements have been made for a staff representative of the American Red Cross to meet at least once a year with the supervising instructors, to discuss current needs of the training program and improvements in first aid practices.

Special Bell System Developments and Activities

BELL System first aid kits, containing standard materials, are tools which help the telephone first aider to apply his knowledge and skill. Three sizes of kits are provided. The large size is kept at convenient locations in central offices, storerooms, and in a suitable place on large telephone trucks. The medium sized kit is usually carried on smaller trucks and kept at locations where only one or two may need it. The small kit is designed for the pocket or tool bag where the larger kits cannot be conveniently carried. Operators' rest rooms are also provided with medicine cabinets containing a selected list of first aid supplies and necessary instructions.

Telephone first aid classes stress the importance of replacing as soon as possible each item taken from the kit,

THEY WILL INSTRUCT OTHERS

Upon completing the Instructors' course, this group will be prepared to give first aid training to fellow employees

PLANT FIRST AIDERS
These men are taking the basic course

of keeping the materials sterile, and of avoiding the possibilities of infection in case of wounds.

As a means of helping to make first aid a part of the regular plant job, a considerable portion of the first aid textbook has been condensed for inclusion in the Bell System Practices—which are the instructions for constructing and maintaining the telephone plant. This condensed information is provided in handbook size for outside plant forces and in larger size for central office plant forces. In this way the first aid text in condensed form is available on the job for review purposes by individual employees, as well as by foremen for training in the fundamentals of first aid new men who haven't yet had an opportunity to take the standard first aid course.

IN addition to this condensed version of the textbook, other closely related information of special significance to outside plant forces and engineers is provided in several sections of the Bell System Practices handbook. These sections concern, for example, the rescue of employees from manholes, from poles, and from "live" circuits. While occupational accidents occur infrequently in the Bell System, the information has been provided and telephone employees are trained in what to do so that they will know how if they should ever be present during such an emergency.

Many of the Associated Companies have conducted first aid contests as part of their training program. During recent years, such contests have usually been confined to district and division competitions. They are also held in some of the companies as a part of evening programs following safety dinners or at similar gatherings. In some cases, the members of the competing first aid teams are selected immediately before the contest by drawing names from a hat. In this way stimulus is given to having the entire personnel proficient in first aid knowledge and skill.

During the past year, first aid was dramatized in an unusual and effective way in one company. In darkened recreation rooms, employees sat tense and alert as huge black bombers raced across the motion-picture screen and bomb-struck buildings dissolved into rubble before their very eyes. As the thunder of warfare diminished and the pictures faded from the screen, curtains parted to reveal the demolished interior of a home. Prone on the floor with the debris lay two victims of the air raid, their clothing torn and stained by "blood" from the make-up kit. Onto the scene of chaos came three first aiders. Then, to a microphone description, they turned efficiently to the assistance of the shocked and bleeding victims. The importance and impressiveness of the demonstration was indicated by a number of favorable comments in the press.

Posters have been used from time to time to call attention to the importance of first aid training and to announce that classes are to be conducted. Articles accompanied by pic-

tures of first aid classes appearing in company magazines or Safety Bulletins have also increased the interest in first aid in the Companies.

Most of the companies have furnished their employees with printed first aid sheets listing the usual types of home accidents and the first aid care that should be applied. They can be gummed to the inside of the door of bathroom medicine cabinet or any convenient surface.

The Bell System companies are making extensive use of first aid motion pictures in classroom work as well as for showing to employee groups assembled upon different occasions. One that has been used by most of the telephone companies is the sound picture titled "Before the Doctor Comes," prepared by the American Red Cross. First aid subjects covered in this picture include control of bleeding, care of shock, artificial respiration, traction splinting, care for burns, and transportation of victims.

For years hundreds of Bell System plant men who have been teaching telephone company classes have also volunteered their time and energy to promote first aid by teaching classes in their local communities. During the past year, Civilian Defense organizations have called for a large number of volunteer workers, especially for those qualified as instructors. To assist in meeting this demand, Bell System companies have accelerated their first aid training programs so that more instructors would be available to volunteer their services to local Red Cross Chapters under whose direction and supervision they would teach first aid classes. Representatives of Civilian Defense groups, churches, schools, boy and girl scouts, police and fire departments are among those who have attended first aid classes taught by telephone company men.

Bell System Men and Women Make Practical Use of Their Training

Many Bell System women are first aid instructors, and thousands more hold joint American Red Cross-Bell System certificates. They, as well as the men, are practical first aiders too, as typified by the following cases which are selected from those that have occurred during recent months.

An elderly woman fell off a bicycle and severed the artery above the temple when her head hit the curb. A telephone operator who had taken first aid some three months before and was in a nearby house was told of the accident. Investigating, she saw two men trying to place the woman in a car while another was attempting to give her a drink of water. The operator found that the arterial bleeding was bad and suspected a skull fracture—which later proved correct. She checked the bleeding and then got one of the men to hold the pressure point. She telephoned for an ambulance, secured a bandage, and treated the victim for shock and skull fracture. The physician in charge at

Instructors' Course

Practice makes these people perfect in artificial respiration and other techniques which they will soon be teaching to other telephone workers

the hospital highly commended the first aid work performed, which is generally believed to have saved the woman's life.

A telephone woman was involved in an automobile accident and suffered a severed artery in her scalp. While her companion walked four and one-half miles over a little-traveled road at night for assistance and transportation, she exerted pressure to stop the flow of blood. Thanks to her courage and to efficient application of first aid to her own injury, she saved her own life.

The extent to which Bell System women have engaged in first aid training is also exemplified by the performance of girls' teams in competition with men's teams. This year, for the first time, girls' teams in one of the companies entered competition in a number of districts. A girl's first aid team solved difficult first aid problems perfectly in three minutes' faster time than their competing rivals, consisting of five men's teams—and won the contest!

OTHER recent incidents indicate the first aid proficiency of Bell System men.

A telephone man arriving at a coal mine for maintenance work saw men running toward the mine opening, and sensed that an accident had happened. Taking his first aid kit from the truck, he ran to the head of the mine shaft.

TRAINING CITIZENS

Above: Ten Associated Company plant men gave their time to instruct this class of school teachers and community leaders. Right: A town's air raid wardens learned first aid from Bell System men

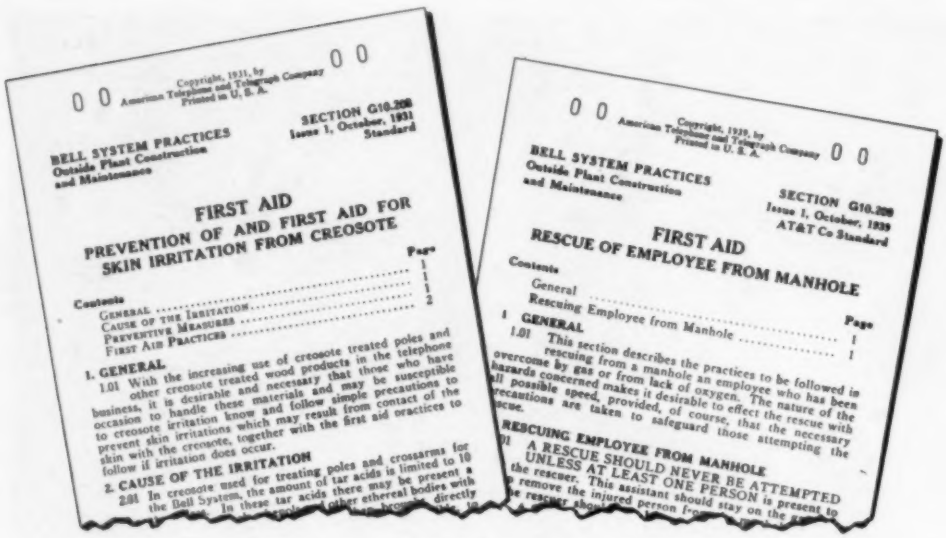
STAGED REALISM

This was the problem posed for one company's first aiders. As they went to work on the "victims," a play-by-play account of the steps they took was given the audience by loud-speaker

Then for three-quarters of an hour he faithfully administered artificial respiration to a miner with no tangible results, and was becoming exhausted, when suddenly the victim moaned. Ten minutes later, when a doctor arrived, the miner was breathing with some degree of regularity. Knowledge of first aid methods acquired as a telephone employee, and prompt and sustained action, had saved a life.

The twin sons of a telephone employee were playing on the floor at home when one of the boys accidentally swallowed a metal ball. Strangling, he ran toward his father with out-stretched hands, gasping for breath. The father picked the child up by the feet and shook him, but this treatment was unsuccessful. He then pried the child's mouth open and stuck his finger down the throat, found the string attached to the ball, and gently and quickly pulled the ball out. This telephone man had finished his first aid training the night before, and firmly believes the training he received enabled him to keep a cool head and to know what to do to save his child's life.

A soldier, in an automobile accident, was thrown against the windshield, and sustained severe cuts on his head and face. A telephone man, obeying the first rule of first aid by giving precedence to the most serious injury as he had been taught in the first aid class three months before, applied pressure to the large artery in the soldier's neck to stop the profuse



BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G10.208
Issue 1, October, 1931
Standard

FIRST AID
PREVENTION OF AND FIRST AID FOR SKIN IRRITATION FROM CREOSOTE

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1. GENERAL

1.01 With the increasing use of creosote treated poles and other creosote treated wood products in the telephone business, it is desirable and necessary that those who have occasion to handle these materials and may be susceptible to creosote irritation know and follow simple precautions to prevent skin irritations which may result from contact of the skin with the creosote, together with the first aid practices to follow if irritation does occur.

2. CAUSE OF THE IRRITATION

2.01 In creosote used for treating poles and crossarms for the Bell System, the amount of tar acids is limited to 10 ... In these tar acids there may be present a ... other ethereal bodies with ... directly ...

BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G10.208
Issue 1, October, 1939
AT&T Co Standard

FIRST AID
RESCUE OF EMPLOYEE FROM MANHOLE

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1. GENERAL	1

1.01 This section describes the practices to be followed in rescuing from a manhole an employee who has been overcome by gas or from lack of oxygen. The nature of the hazards concerned makes it desirable to effect the rescue with all possible speed, provided, of course, that the necessary precautions are taken to safeguard those attempting the rescue.

RESCUING EMPLOYEE FROM MANHOLE

A RESCUE SHOULD NEVER BE ATTEMPTED UNLESS AT LEAST ONE PERSON is present to ... the rescuer. This assistant should stay on the ... remove the injured person from ... be rescuer should ...

FOR THE OUTSIDE PLANT FORCES

Supplementary first aid information relating to certain types of work is included in the pocket volumes of Bell System construction and maintenance practices

arterial bleeding. The pressure on the artery was maintained sufficiently to control the bleeding on the ride to the hospital which took about 25 minutes. The surgeon who expertly repaired the injuries said that the soldier could have died from loss of blood in a very short time if the bleeding had not been controlled properly.

THESE cases are but a few of those that have occurred during comparatively recent months when telephone men and women have expertly applied their first aid knowledge and skill and relieved the suffering and saved the lives of members of their families, fellow workers, and others who have been the victims of accidents.

These telephone first aiders, both men and women, on their regular jobs are scattered all over the country. Bell System plant men, in particular, may be found on the streets and highways, in homes and offices, installing and repairing telephones or placing and rearranging poles, wire, and cables. They travel on trucks and smaller cars wherever the highways of the nation reach. Almost daily since the introduction of first aid training in the Bell System, news accounts have described some act of first aid by telephone people. Recognition of some of the important outstanding cases of this character may be found in the records of the President's Awards of the National Safety Council and in the records of the awards of the American Red Cross, as well as in those of the Bell System Vail Medal Awards.

In addition to preparing telephone people to take active roles in Civilian Defense and other home front activi-

THE WINNERS
This girls' team defeated five men's teams by solving perfectly and in the shortest time difficult first aid problems presented at a district contest

ties, first aid also plays a part in preventing wastage of human and material resources of the nation through accidents on the job, off the job, and at home.

The reason that accidents occur less frequently among persons trained in first aid is that these people have been impressed with the necessity of taking constructive steps to avoid accidents.* Those trained in first aid tend to be more alert in observing conditions and circumstances possessing accident possibilities, and thus are more likely to look one step ahead before acting. Through their knowledge and skill they promptly take proper care of all injuries and therefore prevent more serious consequences. Hence a thorough knowledge of first aid has proved to be a benefit to the individual, to his family, to his fellow workers, and to the community at large during times of peace and times of war.

* See "Safety in the Bell Telephone Companies," BELL TELEPHONE QUARTERLY, October, 1939.

First Aid is a Continuing Activity in the Bell System

No one can say how many additional telephone men and women will become first aiders during the next few years, but the number is sure to be large. The joint American Red Cross-Telephone Company agreement provides a sound basis for a continuing Bell System program. It is designed to train and to keep trained every telephone employee so that he or she may give the immediate and temporary care required in case of accident or sudden illness. A telephone first aider is able to put his knowledge and skill to work, whenever the occasion arises, confident that he is backed by the "know how" of large organization and practical experience on a national scale.

It is essential that first aid training in the Bell System be maintained at a high level. To meet these high standards, the instructors must continue to be conscientious about their work, know first aid and have developed a

FIRST AID AND SAFETY GO HAND IN HAND

Employees trained in first aid are doubly conscious of the need for working safely. This safety creed has been adopted by and is prominently displayed throughout the Bell System

high degree of skill in its application, and know how to train others. Bell System instructors meet these requirements; and the American Red Cross, the American Telephone and Telegraph Company, and the Associated Companies have a great appreciation of the loyal and devoted service rendered by the many instructors who, year after year, contribute their time and enthusiasm to inculcating the knowledge of first aid among the men and women of the Bell System and, perhaps no less importantly, among the public.

First aid knowledge may be considered a valuable personal tool; for the wish to lessen suffering, when combined with the ability to do so, results in a keen satisfaction which is its own reward. Now, with our nation at war, all first aiders realize that through their training they are able to help conserve manpower and check the interruption in war production caused by accidents while at work and when off the job. This is a definite, personal contribution to defense. First aid training repays each individual many times for the relatively few hours required to obtain the training.

A. T. & T. STOCKHOLDERS IN TWO WARS

An Increase in Owners from 59,415 to More Than 640,000 Between 1914 and 1942 Has Been a Vital Factor in Enabling the Bell System to Serve the Nation in Peace and War

By CLINTON S. VAN CISE

At the end of 1914, shortly after World War I broke out in Europe, the stock of the American Telephone and Telegraph Company was held by 59,415 stockholders. The growth which has occurred in ownership of the stock since that time has been a vital accompaniment to the growth in the Bell System. Today there are in each of three states, New York, Massachusetts, and Pennsylvania, more A. T. & T. stockholders than there were in the entire country in 1914, and with a current roster of more than 640,000 holders the total stock list is now almost eleven times larger.

Under the restrictions and rationing which are now being imposed on every hand, it is easy to forget the extent to which things changed in the years from 1914 through 1941. In that period, however, an astonishing development took place in our mode of living. The automobile completely emerged from the luxury class, air travel became routine, our movies acquired sound, and listening to the radio developed into a national pastime. In 1914 the completion of the transcontinental telephone line between New York and San Francisco represented a triumph of Bell System engineering. Today there is more telephone talk between New York and San Francisco than there was then between New York and Cleveland.

The factor of population growth, from 99,000,000 in 1914 to 134,000,000 in 1941, would alone have involved a 35 per cent increase in the nation's production and service equipment to maintain our scale of living. In actuality, however, the increase in the nation's capital assets was far outstripping population growth until we were overtaken by the most prolonged depression in our history; so that, even with this interruption, we were enjoying at the onset of the present war a scale of living which could only have been created and served by a marked expansion in corporate enterprise under our peculiarly American formula.

It is obvious that, as our standard of living rose, the telephone would become a greater factor in our business and social life, provided costs could be kept within reason by development of the art. Whereas in 1914 there

was one telephone for every ten persons in the United States, there was one telephone for every six persons at the end of 1941. And even before the stimulus of the war emergency, these telephones were in use more of the time. Daily telephone conversations over Bell System wires, which averaged 23,000,000 in 1914, rose to 84,000,000 in 1941, and the total investment in telephone plant to render this service increased more than five fold. To finance this growth in telephone plant, investors added to the capital account of the Bell System from 1914 through 1941:

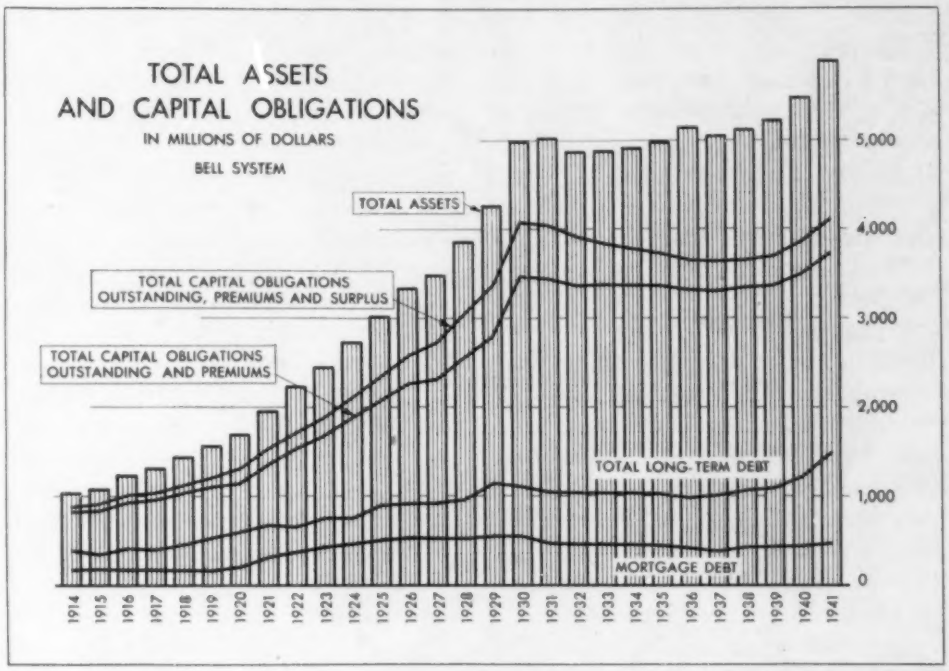
Through purchase of A. T. & T. stock	$1,770,000,000
Through purchase of stock of subsidiary companies	55,000,000
Through purchase of Bell System bonds and notes	1,081,000,000
Total	$2,906,000,000

THESE millions of dollars are counters of work and materials that have gone into constructing the Bell System, but they are also much more. They represent the day-by-day savings which have been put directly into the business by people throughout the country and in all walks of life: the corner druggist, the school teacher, men in shop and field, clerks and stenographers, housewives in tens of thousands. They also represent the bits of capital which thrifty people have put into savings accounts, life insurance policies and old age annuities, and which in part have found their way into the Bell System through purchases of its bonds by savings banks and life insurance companies. Too small in themselves to accomplish much, such bits of capital have aggregated enough in total to be a vital factor in financing the great industries of the nation which look to the public for their capital needs.

At the end of 1914 there were in the United States perhaps 1,000,000 holders of common stock. Among these, the owners of A. T. & T. stock, numbering more than 59,000, composed the second largest group. By the close of World War I, however, the owners of A. T. & T. stock had increased to 112,000 outnumbering other stockholder groups, and ever since they have exceeded in number the stockholders of any other American company.

ALTHOUGH owners of A. T. & T. stock now exceed 640,000 in number, almost eleven times the total in 1914, the essential character of the ownership is much the same. At that earlier date, the stock was already widely held, and such changes in distribution as have since taken place have only served to broaden this ownership. Then, as now, no single stockholder or small group owned a controlling interest or even a large proportion of the shares, and no individual owned as much as one per cent of the total. The holdings of owners of 100 shares or more have declined since 1914 from 69 per cent to 49 per cent of total; shares in the hands of foreign holders have decreased from 4 per cent to 2 per cent of total; and shares held in brokers' names have dropped from 5 per cent to 1½ per cent of total.

Numerically, ownership of the stock by women has shown the greatest


TOTAL ASSETS
AND CAPITAL OBLIGATIONS
IN MILLIONS OF DOLLARS
BELL SYSTEM
TOTAL ASSETS
TOTAL CAPITAL OBLIGATIONS OUTSTANDING, PREMIUMS AND SURPLUS
TOTAL CAPITAL OBLIGATIONS OUTSTANDING AND PREMIUMS
TOTAL LONG-TERM DEBT
MORTGAGE DEBT
5,000
4,000
3,000
2,000
1,000
0
1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941

Growth of the Bell System over the years indicates the increasing value of telephone service to the nation.

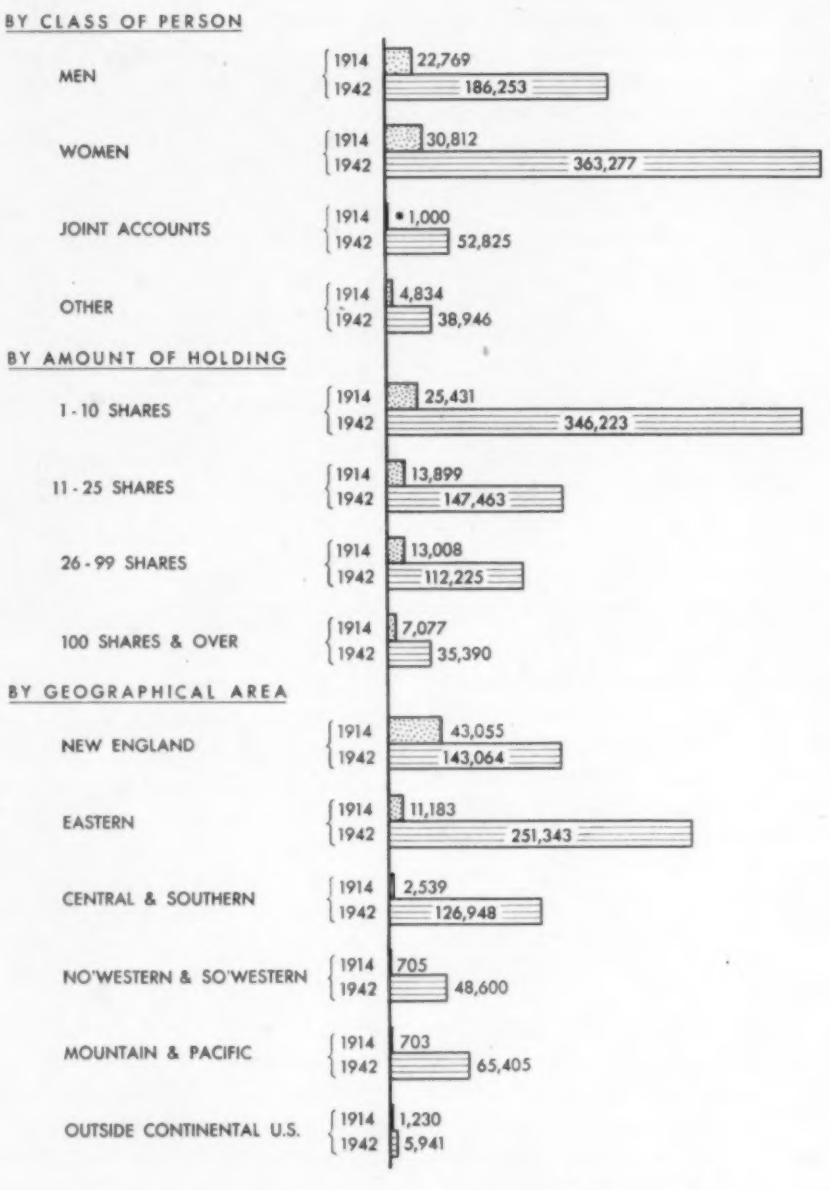
increase. Approximately 363,000 women are today registered shareholders of the company, as compared with approximately 30,800 at the end of 1914, and they now own 43 per cent of the stock. A type of investment holding which has become increasingly popular in recent years is the joint account of two owners with right of survivorship. More than 50,000 joint holdings are now registered on the stock books of the Company. Approximately 186,000 men are registered shareholders today, as compared with approximately 22,700 at the end of 1914, and they now own directly 28 per cent of the stock. About 62,000 owners are Bell System employees.

A less numerous but still important group are the trustees who hold A. T. & T. stock. There are, in all, 32,000 trust accounts on the books, with a registered ownership of $190,000,000 par value of the stock, representing in themselves a sizable stock list. Institutions, corporations, and private firms compose the remaining 6,800 registered owners. In this group there are many religious organizations, schools, colleges, hospitals, and similar eleemosynary institutions.

Geographically and in the size of individual holdings, the ownership of the stock is in general accord with the investment wealth of the country—although there is still a somewhat higher ratio of ownership in New England, where the telephone was invented and originally financed. In each of six states there now live

NUMBER OF A.T.&T. STOCKHOLDERS

December 31, 1914 - 59,415 — September 15, 1942 - 641,301

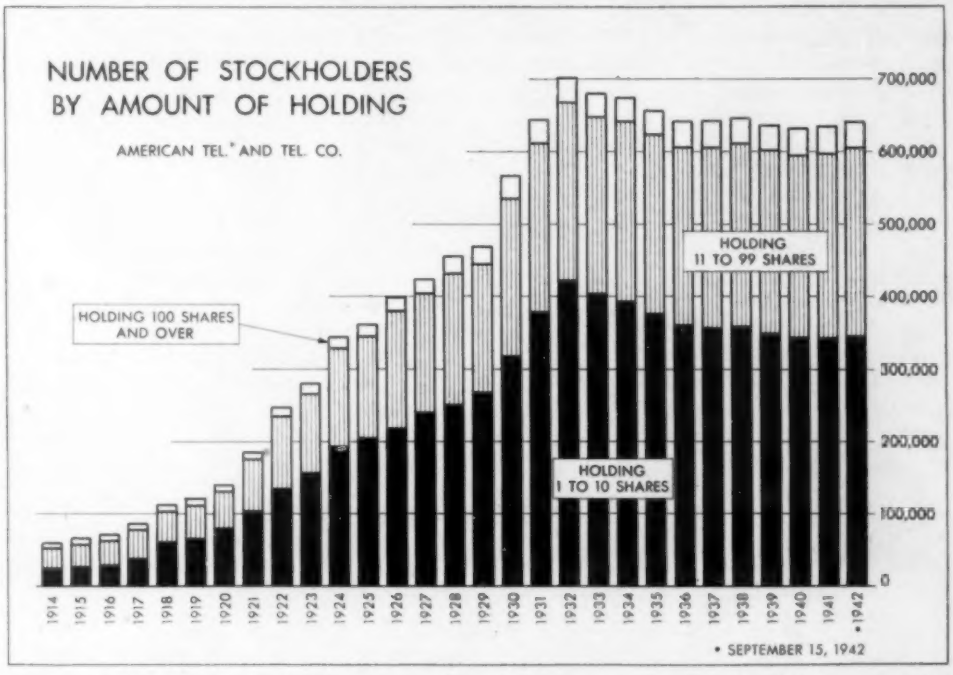


About 71% of A. T. & T. stock is held by men and women, 5% in joint accounts, 22% in the names of trustees, insurance companies, corporations, private firms, etc., and less than 2% in the names of brokers.

40,000 or more owners of A. T. & T. stock; in each of seventeen states there are between 5,000 and 40,000 owners; and in no state are there less than 400 owners. A large representation of stockholders, of course, reside in the bigger cities of the country, but they are numerous in the smaller communities also. For example, a study made some years ago of the ownership of the stock in Pennsylvania revealed that A. T. & T. stockholders resided in three-fourths of its cities and towns of more than 1,000 inhabitants.

While it may be stated statistically that the average holding per stockholder is 29 shares, representing roughly $3,900 in equity book value, on the other hand approximately 493,000 stockholders actually have holdings of 25 shares or less each, and 207,000 have holdings of five shares or less each. Holders of 100 shares or more each, who own 49 per cent of the total stock, number 35,000. In this group are some 825 holders of 1,000 shares or more each, owning 15 per cent of the stock, but a majority of these are banks and brokers, investment trusts, insurance companies, and other fiduciaries who hold the stock for the beneficial interest of a great many others. It is estimated, for example, that banks and brokers hold the stock for more than 10,000 customers, investment trusts for more than 135,000 investment trust certificate holders, and life insurance companies for more than 3,000,000 policyholders.

The composition of the stock list by the length of time shareholders have retained their ownership interest



Average holdings per stockholder are now 29 shares as compared with 56 shares in 1914.

is indicative of the usual intention of shareholders to invest their money for the long run. Of the present holders, approximately 340,000 have owned the stock for more than ten years and another 120,000 for more than five years. It is estimated that 12,000 stockholders, or 20 per cent of the total owning stock back in 1914, still have A. T. & T. shares registered in their names. This represents an average reduction of 3 per cent per year in the number of such stockholders for the period from 1914 through 1941.

WHILE the A. T. and T. Company may be the most widely owned enterprise in the country, many others are owned on a similar scale in relation to their size. There are now in excess of 20 corporations with more than 100,000 stockholders each, and for industry as a whole the grand total of common stockholders is estimated to be between eight and nine million. This number represents a substantial but by no means a stratified segment of the population, for it includes all classes of people who have shared the incentive to save and invest. A generous proportion of them, to be sure, are women, and a large number are doubtless elderly people. And with the country at war, there must be many thousands in our fighting forces.

The great broadening of stock ownership which occurred in the years between World War I and World War II has been by no means the least important among the social developments in this country. Nowhere else has there been so widespread a source of the venture money of people who believe in their country's future and want the risk and profit of ownership. This habit of investment by great numbers has been an evidence of our high standard of living, but, more than that, it has played a vital part in the production which made that high standard possible.

FOR THE RECORD

IN THE ARMED SERVICES

SOME 29,000 male employees of the Bell System are in the nation's armed forces as this issue of the MAGAZINE goes to press. A number of women employees are now in the auxiliary services. Since the publication of the last list, of 59 names, in the August issue, the following 30 members of the General Departments of the A. T. & T. Company have gone into the military services:

Charles R. Abels, Messenger, Information Dep't	Private, U. S. Army
Charles H. Albin, Clerk, Information Dep't	Aviation Cadet, U. S. Army
William S. Baker, Jr., Trimmer, Gen'l Serv. Bureau	Private, U. S. Marine Corps
Clefton R. Beck, Jr., Senior Clerk, Comptroller's Dep't	Apprentice Seaman, U. S. Navy
Hilda T. Berry, Clerk, O. & E. Dep't	Auxiliary, Women's Army Aux. Corps, U. S. Army
Erich G. Brunngraber, Jr. Statistician, Comptroller's Dep't	Private, U. S. Army
William L. Cronk, Messenger, Information Dep't	Private, U. S. Marine Corps
Henry G. Dudley, Physician, Pers. Rel. Dep't	Lieut. (j.g.), Medical Corps, U. S. Navy
Donald A. Field, Jr. Statistician, Comptroller's Dep't	Lieut. (j.g.), U. S. Navy
Hugh Gillespie, Jr. Draftsman, Gen'l Serv. Bureau	Private, Air Corps, U. S. Army
Kenneth W. Haemer, Jr. Statistician, Comptroller's Dep't	1st Lieut., S.O.S., U. S. Army
Allan C. Johnson, Engineer, O. & E. Dep't	Captain, Engineer Corps, U. S. Army
Willard W. Kelsey, Accountant, Comptroller's Dep't	Private, U. S. Army
Edmund C. Lehr, Clerk, Treasury Dep't	2d Lieutenant, U. S. Army
Robert Leopold, Jr. Statistician, Comptroller's Dep't	Private, U. S. Army
Clifford A. Lohr, Messenger, Gen'l Serv. Bureau	Private, U. S. Marine Corps
Paul F. Nagle, Engineer, O. & E. Dep't	Lieutenant, U. S. Navy
John J. O'Brien, Senior Clerk, Treasury Dep't	Chief Storekeeper, U. S. Navy
Norwood C. Potter, Statistician, Comptroller's Dep't	Major, Ordnance Dep't, U. S. Army
Howard G. Raymond, Clerk, O. & E. Dep't	Private, U. S. Army
John L. Riker, Physician, Pers. Rel. Dep't	Captain, Medical Corps, U. S. Army
Paul S. Rippier, Senior Clerk, Comptroller's Dep't	Private, U. S. Army
David R. Rutter, Engineer, O. & E. Dep't	Lieutenant, U. S. Navy
Albert J. Schaufler, Type Stamper, Gen'l Serv. Bureau	Private, U. S. Marine Corps
James L. Schulte, Type Stamper, Gen'l Serv. Bureau	Private, Air Corps, U. S. Army
John Seehof, Photostat Operator, Gen'l Serv. Bureau	Private, Air Corps, U. S. Army
Edward L. Sherman, Engineer, O. & E. Dep't	Lieutenant, U. S. Navy
Theodore L. Simis, Trimmer, Gen'l Serv. Bureau	Private, Signal Corps, U. S. Army
Arthur J. Squires, Clerk, Comptroller's Dep't	Apprentice Seaman, U. S. Navy
John M. Stewart, Messenger, Gen'l Serv. Bureau	Apprentice Seaman, U. S. Navy

J. H. RAY ELECTED VICE PRESIDENT–GENERAL COUNSEL, SUCCEEDING THE LATE C. M. BRACELEN

AT the meeting of the Board of Directors on October 21, John H. Ray was elected Vice President and General Counsel of the American Telephone and Telegraph

Company. Mr. Ray has been Counsel of the company since 1936. During nearly 20 years of service with the Bell System he has also served as Vice President and General Counsel of the Western Electric Company and, before that, as General Solicitor of the A. T. and T. Company. Prior to joining the A. T. & T. Co. in 1923, he practiced law in Minneapolis. In his new post Mr. Ray succeeds the late Charles M. Bracelen.

Mr. Bracelen, Vice President and General Counsel of the A. T. & T. Company for more than 16 years, died October 8 at his home in New York City. He was 64 years old. Mr. Bracelen joined the company in 1918 after spending several years in general legal practice in Minneapolis. He was a graduate of the University of Nebraska, class of 1902, and later studied law there and also at Creighton University, Omaha. After coming with the company in 1918, Mr. Bracelen temporarily went into Federal government service in the office of the Postmaster General, where he handled litigation arising out of war-time government control of wire systems. In 1919, when telephone and telegraph systems were returned to private management, Mr. Bracelen resumed his service with the American Company, first as an attorney, then as General Solicitor in 1921, as a Vice President in 1924, and two years later in the post he held at his death.

INDEX TO VOLUME XXI AVAILABLE

AN Index to Volume XXI (1942) of the BELL TELEPHONE MAGAZINE may be obtained upon request to the Information Department of the American Telephone and Telegraph Company, 195 Broadway, New York, N. Y.

CONTRIBUTORS TO THIS ISSUE

ENTERING the first Officers' Training Camp at Fort Sheridan, Ill., as a student artillery officer, at the time of graduation from the University of Wisconsin with the B.S. degree in chemical engineering in 1917, KEITH S. MCHUGH was commissioned a First Lieutenant in the Ordnance Department three months later. He became an instructor in machine guns and small arms at Springfield Arsenal, and was later made commanding officer of the national machine gun and small arms school at Camp Hancock, Ga., before sailing overseas as a Captain in September of 1918. Returning to this country in February, 1919, he joined the A. T. & T. Company as a clerk the following month. From July, 1919, to November, 1921, he was an engineer in the O. & E. Department. He was then for three and a half years General Commercial Engineer of the Chesapeake and Potomac Telephone Company in Washington, D. C. For the next four years he was General Commercial Manager of the Upstate and then of the Long Island area of the New York Telephone Company, and became a Vice President of that company in May of 1929. In October of that year he became Commercial Engineer of the A. T. & T. Company; was appointed an Assistant Vice President in December, 1934; and in January of 1938 was elected a Vice President.

GRADUATED from Dartmouth College with the B.A. degree in 1909, HAROLD M. PRESCOTT entered the Bell System two years later as a traffic student with the Pacific Telephone and Telegraph Company at Los Angeles. He was engaged in traffic work on the Pacific Coast for 17

years; from 1919 to 1925 he was general toll supervisor, and division traffic manager from 1925 to 1928. In the latter year he transferred to the A. T. and T. Company as head of the central office results group in the Department of Operation and Engineering. In 1929 he became Traffic Results Engineer, and on January 1, 1940, was appointed Traffic Engineer of the company. He is the author of "Toward a More Pleasing Service," in the BELL TELEPHONE QUARTERLY for April, 1940.

GRADUATED from the University of Kansas in 1915, AUSTIN BAILEY received his Ph.D. degree from Cornell University in 1920, after having served during the World War as a Second Lieutenant in the Signal Corps, assigned to the radio laboratories at Camp Alfred Vail (now Fort Monmouth). In 1920 he accepted a position as superintendent of the apparatus division of Corning Glass Works, leaving this in the Fall of 1921 to become Assistant Professor of Physics at the University of Kansas. He joined the Bell System in 1922, his first assignment being on radio problems in the Department of Development and Research of the American Telephone and Telegraph Company. Dr. Bailey was sent to England and Scotland in 1926 for a year's work in connection with the establishment of the first commercial transatlantic radio telephone circuit. In 1934 he was transferred to the Bell Telephone Laboratories, where he continued with the development of radio for Bell System applications. In 1937 he returned to the A. T. and T. Company, in the Department of Operation and Engineering, where he has since been engaged with the technical aspects of numerous radio projects, such as ship to shore, overseas, emergency, point to point, and vehicular services. He has contributed to several Bell System publications articles dealing with various aspects of radio telephony—most recently as co-author of "New Channels for Old," in the issue of this MAGAZINE for August, 1941.

RECEIVING the B.A. degree from Lafayette College in 1907, and the LL.B. degree from New York Law School in 1909, ROBERTSON T. BARRETT practiced law until 1918, and for the next three years was engaged in newspaper work. He joined the Information Department of the A. T. & T. Company in 1921; and since 1936, when he was appointed Historical Librarian, he has combined the duties of that post with other departmental activities. He is editor of the *Telephone Almanac,* and has contributed a number of articles to the MAGAZINE, the most recent being "The Conquest of a Continent," in the issues for July and October, 1940, and February, 1941.

ENTERING the University of Kansas in 1916, ERLE S. MINER left school in 1917, a few days after the beginning of World War I, to enlist in the 35th Division of the United States Army. Returning from overseas in 1919, he reëntered the University and received his B.S. in E.E. in 1922. He then joined the Southwestern Bell Telephone Company at Topeka, Kansas, and for the next four years worked on various plant department assignments, including those of central office repairmen, toll engineer, exchange engineer, and district plant chief. In 1926 he was transferred to the general plant supervisor's office of the Southwestern Company in St. Louis to assist with construction methods and results work. After a year, he was appointed general plant installation supervisor, and later became general plant training supervisor. In 1929 he was transferred to the A. T. and T. Company to work on plant training problems in the Operation and Engineering Department. From 1933 to 1936 he served on a committee handling problems affecting the Bell System in connection with the NRA Codes. In 1937 he became Safety Engineer, the position he now holds. During the last two years Mr. Miner has been closely identified with the Bell System first aid training program as part of the safety engineering

assignment. He is author of "Safety in the Bell System Companies," which was published in the BELL TELEPHONE QUARTERLY of October, 1939.

ENTERING the Bell System in 1914, after graduation from Williams College with the B.A. degree, CLINTON S. VAN CISE was employed in the accounting department of the New York Telephone Company. He saw service on the Mexican border in 1916; and he was commissioned as First Lieutenant in the Ordnance Corps in 1917 and was discharged in March of 1919 with the rank of Captain in the Reserve. He returned to the New York Company, but later that year took a position with an investment firm, with which he remained until the close of 1920. On January 1, 1921, he joined the A. T. & T. Company in the statistical division of the Comptroller's Department. Later that year he was transferred to methods work in the Treasury Department. On January 1, 1923, he became Assistant to Treasurer, and the following March he was appointed an Assistant Treasurer. In the Treasury Department, he heads the administration division.